FLIGHT

First Aero Weekly in the World.

Founder and Editor: STANLEY SPOONER.

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport.

OFFICIAL ORGAN OF THE ROYAL AERO CLUB OF THE UNITED KINGDOM.

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Flight.

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The National Aspect of Flying.

On the eve of Olympia, in the hope that several who do not regularly read FLIGHT may be attracted to peruse these lines, as the result of having bought at least so much as a souvenir of their visit to the Aero Exhibition, we would reiterate our plea for a wider recognition of the national aspect of flying. It is all very well for those who do not fly, and for those who have no intention of flying, to look with a detached air of curiosity on the wondrous work of the aeroplane. What we want the man in the street to understand is, that the aeroplane is the latest instrument of war, and that as such it symbolises a department of the Government's activity, in which neither pains nor money should be spared to attain to perfection such as will ensure the supremacy of England in the air.

We say the aeroplane symbolises this department of activity because we would make it very clear to Englishmen at large, that it is not the aeroplane as a machine in which he needs to feel a personal interest so much as in the development of national aeronautics as a whole. And the reason why we can say that the Englishman at large should feel a personal interest in the development of national aeronautics is because it is the English taxpayer who must find the money for that development.

On broad principles, it is recognised that the public has a right to a voice in the expenditure of funds, so what we desire particularly to accomplish is the creation of considerably more public enthusiasm for the efficient aeronautical armament of Britain. To that end, all that the public need concern themselves with is a willingness to demand the setting aside of an adequate sum of money in the forthcoming and ensuing estimates.

It is time, if we may say so, that the daily Press, as representing the public at large, took this matter up strenuously on the nation's behalf and took pains to tell the people why they should demand an adequate vote for aeronautics this year. While aviation has received a great deal of encouragement from the lay Press, for which all concerned are extremely grateful, the fact remains that the national importance of the movement has by no means yet taken a proper grip of the nation's mind. Nor will it do so, so far as we can see, until the daily Press makes the subject its own.

Now is the time. If the Press would obtain the gratitude of those who have been striving to keep aviation alive in this country, it will help towards procuring the insertion of a million sterling in the Estimates for aeronautics this year. It is a long way from assured, in spite of all rumours, that any such sum is at the moment in the Chancellor's mind. There is, however, no reason whatever why it should not be; no keeper of the Public Purse has yet shown himself adverse to providing for a popular vote. It is a mere matter of altering a figure here and there, and would easily be accomplished once it was made clear that the alteration was the wish of the people.

In these days, only those who ask for what they want get anything. From those who do not ask is taken even that which they would try to keep. We ask for a million for national aeronautics this year, but then we stand in the position of a biassed person, inasmuch as we are frankly concerned with the prosperity of the aeronautical industry which it is our purpose and interest to encourage. This association, however, by no means makes our attitude less just.

Unless the public—which is to say, the daily Press—takes up the matter in all seriousness, we are likely to

have to be content with what we can get, and that is likely to be far less than we want. Just as there is small purpose in locking the stable door after the horse is stolen, so is it a waste of breath to ask for more when the Nation's money has already been apportioned. Everything depends on having an adequate sum put down in the Estimates, and that in itself depends on the public making it very clear that it regards such a vote as necessary.

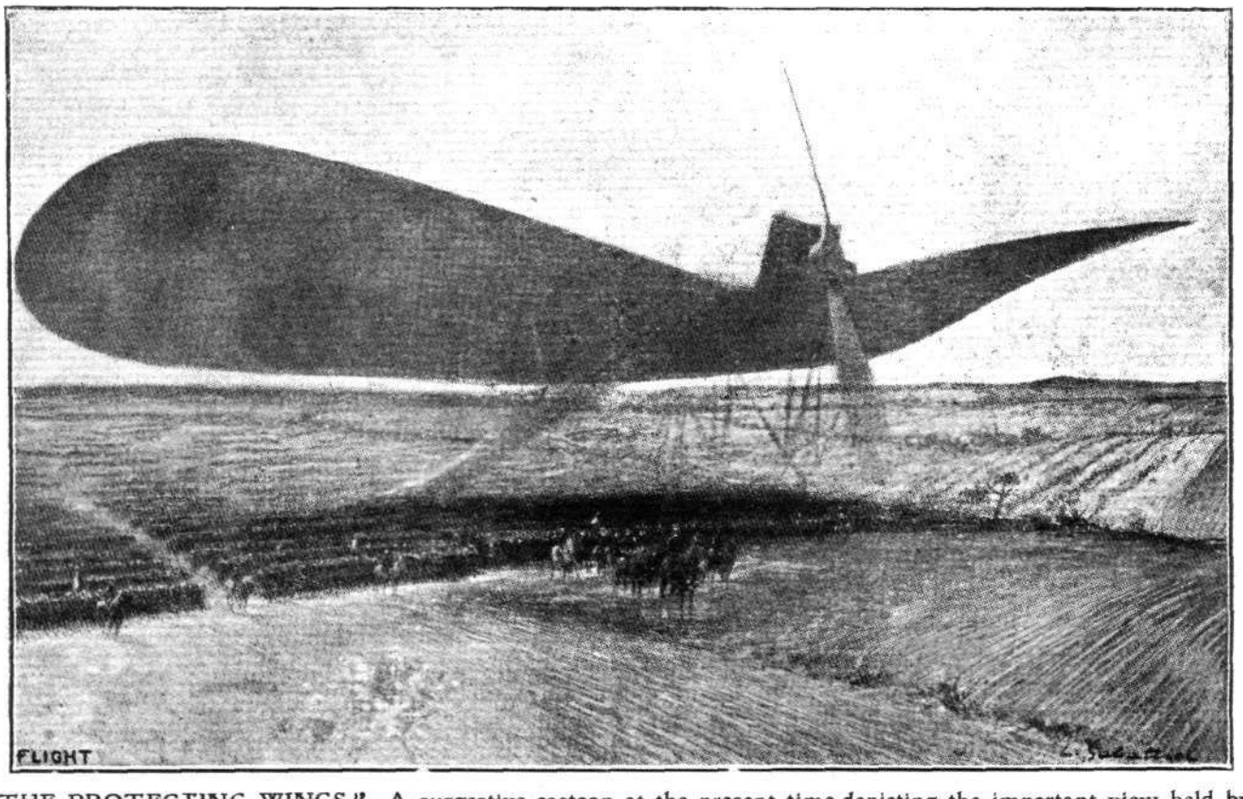
There are other interests at stake, and those who have them at heart are naturally not going to spend their time in scheming concessions for things in which they are not directly concerned. Those who get what they want are those who can bring most support into the arena. We feel convinced that if the public once thoroughly realised the national situation, that there would be no hesitation in its demands for the efficiency of aeronautical equipment. Unfortunately, we fear that the public mind has been much distorted by a persistent criticism of the authorities that so far from really touching the spot has mainly reflected on the ability of the executive. So long as the public is told, what we believe it thinks it has been told, which is that those responsible for the administration of national aeronautics are incompetent muddlers, it is not to be supposed that the taxpayer will feel much enthusiasm at the prospect of voting them more money to squander. No impression could be more grossly unfair than this, and we doubt indeed whether such reflection was ever at heart intended by those responsible for its instigation. There are many signs, however, that such an impression is rife, and under the circumstances the only thing that is likely to remove it is a wholesale campaign in favour of national supremacy in the air on the part of the daily Press, which may best be realised by confining all efforts on securing an adequate vote.

As we have said over and over again, the situation at bottom resolves itself solely into a question of funds. It is useless to criticise the Government in season and out of season, because it is perfectly well known that the Government has only a certain amount of the public money to spend, and that it is the last body in the world to make any gratuitous efforts to spend it in a manner likely to be unpopular with the people.

If Englishmen are content to be passively unconcerned as to whether the nation is or is not adequately equipped for aerial reconnaissance and combat, then the chances of bringing this country on to a level of equality with the other great Powers is remote indeed. The average Englishman has, we firmly believe, little or no conception of what is being done abroad, by France and by Germany in particular. He still regards flyers as a set of peculiar people who are strangely willing to risk breaking their necks, but it has certainly not yet entered into his soul that it is likely to be vital to this country, and that we as a nation are in a very small way of aeronautical business, and that if it came to a war we might find ourselves hard put to it to muddle through with our imperfect aerial equipment.

It may be that the national service in arms to which Frenchmen and Germans are subject in their early manhood gives them a little of the soldier's point of view, and so makes their mental attitude responsive to a military idea. Thus, either a Frenchman or a German would probably appreciate at once the significance of aerial reconnaissance, in that it implies playing the game of warfare with all your opponent's cards on the table. Anyone with even a rudimentary sense of military operations would speedily recognise the revolutionary nature of such a situation, which, by the way, is all the more significant to an army such as our own, which is essentially of an expeditionary character.

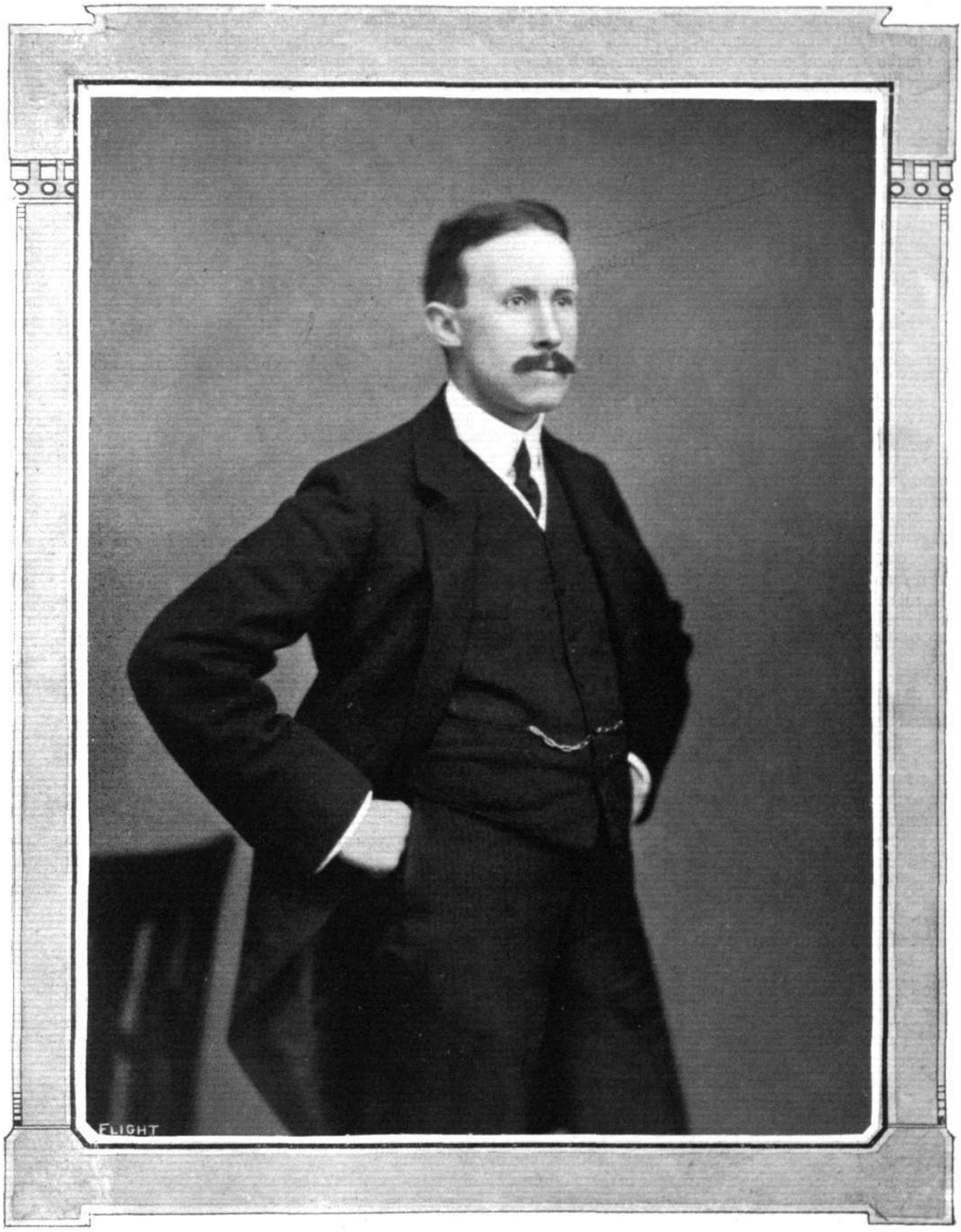
It will be a bad day for England indeed when we have to fight land battles on this island. The Royal Flying Corps is an expeditionary force and its establishment



"THE PROTECTING WINGS."—A suggestive cartoon at the present time depicting the important view held by the French nation of the aeroplane in warfare.—*L'Illustration.*

MEN OF MOMENT IN THE WORLD OF FLIGHT.

Pioneer Pilot-Constructors.



MR. J. W. DUNNE.

has from the first been designed to that end. That is no reason however why the officers of the Royal Flying Corps should be forced to exist in an expeditionary state, as they have done more or less since they came into existence.

One little point that seems to have been overlooked in the finance of national aeronautics is that so far we have had to make a capital outlay out of income, and, as any commercially minded man knows full well, it is a slow and tiresome mode of getting on to an efficient footing. It is all very well to say buy aeroplanes and still more aeroplanes, and we have very good reason to be more anxious than most people that the orders for aeroplanes should come in thick and fast for the benefit of the industry, but it is nevertheless ridiculous to close one's eyes to the essential elements of harmonious progression. In order to make use of aeroplanes, the Royal Flying Corps must possess sheds in which to house them, grounds over which to fly them, men able and willing to pilot them, and last, but may we say not least, something approaching respectable quarters in which those men can live. Now some of these items quite evidently represent capital outlay as distinct from annual expenditure. Barracks, for instance, once erected, will, or should, last for a reasonable time. It depends how they are built, of course, but other things being equal, one may anticipate that they will outlive an aeroplane or two. In any case, there remains the outstanding fact that suitable accommodation is absolutely essential, and that so far as we can see there is comparatively little of it for the Royal Flying Corps at the present time.

Then there is the question of flying grounds. One cannot fly an aeroplane in any old field, and, indeed, it is by no means easy to find suitable flying grounds in a country like England. The purchase of that at Upavon, which was so much criticised at the time, seems to have turned out very well, and, indeed, we have heard very high opinions of it. It is little enough to look at, we must admit, but it has served its purpose admirably, and that is everything; but, let us not forget that Upavon is the headquarters of the Central Flying School, that is to say where pilots go through their finishing course before becoming attached to the Royal Flying Corps proper; in fine, the Central Flying School needs and uses the whole of the Upavon ground, none of which is available for the work of the Flying Corps itself.

Taking one thing with another, it seems to us essential that an adequate capital outlay should be devoted to the proper establishment of the Royal Flying Corps, for until this is done it is simply out of the question to expect any extensive purchase of machines for further development. It is by no means out of the way to suggest that a quarter of a million should be placed to capital expenditure for the Royal Flying Corps next year. We can assure those members of the trade who are anxiously awaiting the time when they shall receive orders for aeroplanes by the hundred that the expenditure of sufficient money on grounds and accommodation is the quickest way to the realisation of their desire. Without men it is impossible to fly the machines, and without barracks and without sheds it is impossible even to keep, let alone use, either the one or the other.

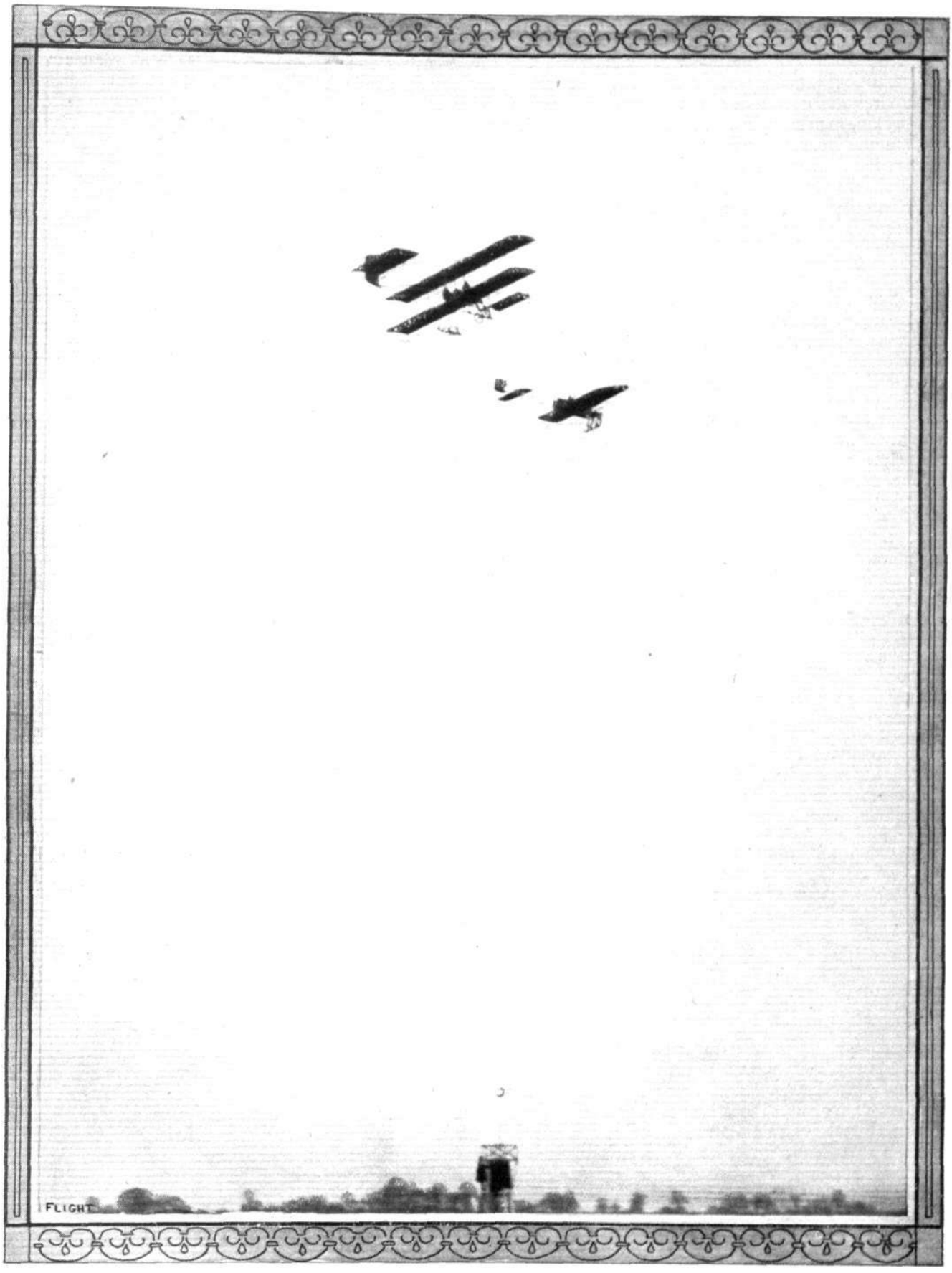
Moreover, it is highly improbable that we shall see any marked expansion of policy in the matter of aeronautical defence until the Flying Corps, as it is at present proposed to be established, is in full and efficient working order. So far as we understand the situation, the Flying Corps is essentially an expeditionary force—that is to say, its object, in so far as the Military Wing of it is concerned, is to fight overseas. Such being the case, it is apparent that the question of transport forms a vital consideration, and it is mainly for this reason that we venture to express the opinion that we would rather see dirigibles left out of the consideration by the military side if there is to be any shortage of money. Much better, in our opinion, to concentrate upon the perfection of aeroplanes for military purposes. It is all very well for Germany and for France, who are very much concerned about military operations on their own soil, to organise an elaborate inland system of airship stations.

We are speaking, of course, solely of the military aspect of the situation. The naval side of the problem is entirely a different matter, and it may well be that the navy will need to spend a considerable amount of money on dirigible development. Indeed, we go so far as to say that it is the proper thing for the Admiralty to undertake; not all of the airships stationed abroad are far removed from the sea coast. England depends absolutely on her navy, and nothing on earth must prevent that navy from being the most efficient fighting force in the world. The development of aeronautics has unquestionably altered the whole outlook of warlike operations, and not less by sea than by land. It is by no means certain that the navy can be entirely served by hydro-aeroplanes, and whether it is the opinion of some or not, the fact still remains that the navy should know all there is to know about dirigibles.

It is very proper that foreign dirigibles should be purchased, through English firms, for experimental purposes, but it is rather a serious thought that there is not one large factory in England devoted to the pursuit of dirigible construction. We omit of course the Royal Aircraft Factory, which is essentially experimental by design and purpose, and is no more equipped for quantity production of anything than is the average householder's back-yard. It is thoroughly serious, as we have remarked, when in this country there is, to all intents and purposes, only one private individual who has thus far interested himself consistently in the subject. Around Mr. E. T. Willows we trust that some day we shall be able to record the existence of a very large and powerful commercial organisation devoted to airship construction.

If a quarter of a million is spent by the navy this year in doing something really worth while along such lines as it sees fit, the nation will be well on its way to saving many times that sum in future, and there is nothing in the world that could possibly be better for the aeroplane industry itself, which is at the moment in pressing need of greater business.

As more is known about dirigibles more will also have to be found out about the best means of attacking them. It may well be that the aeroplane will prove very useful in this work, but we do not now refer so much to the aeroplane as it at present exists, as to some specially designed type of machine that embodies fighting qualities in a more pronounced degree. We trust that no member of the aeroplane industry has forgotten the very pointed comment contained in the judges' report on the Military Trials, which was to the effect that of all the machines present only the ill-fated Mersey showed any evidence of having been designed with a main view to military requirements. The situation, so far as the industry is concerned, is, of course, somewhat acute. Those who have aeroplanes of a type that they can sell are only too anxious not to change, while those who have machines of a type that they find difficulty in selling are none too



AN AIR GREETING AT HENDON ON SATURDAY AFTERNOON.—Desoutter, on a Blériot, passing under and waving his hand to Manton on the Grahame-White biplane.

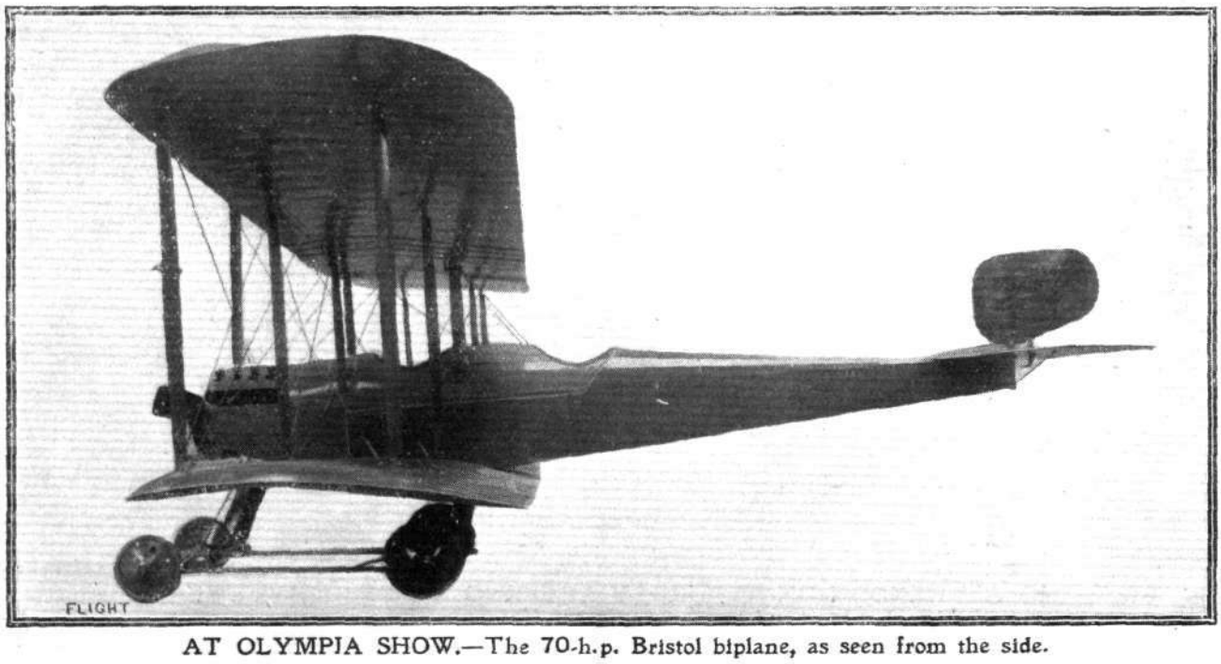
willing, even if they are able, to spend the money on still further pioneer development.

Nevertheless, what, so far as we can judge, is really wanted is the fighting aeroplane. It was very clearly brought out at the discussions held by the Aeronautical Society as long ago as December, 1911, that at least two types of military machine would be required. One would be very fast for scouting purposes, the other necessarily slower because primarily designed for carrying arms and ammunition. Various designers have seen fit to build large machines, but comparatively few have really taken the gun question to heart. The later Henry Farman biplanes are probably the best examples of military machines in existence to-day, if only for the reason that they have a clear outlook in front free from any structural members that might be shot away. The central tractor screw type of aeroplane may or may not have its uses for this type of aircraft in the future, but at the moment it unquestionably seems to be a great handicap to the realisation of the essential qualities apparently required by the would-be military users. If those who build them fail to arouse the interest of those whom they expect to buy them, the fault is surely only on one side.

So important does the development of a satisfactory fighting aeroplane appear to us to be at the present time that we should like to see a very considerable sum of money held in reserve for the especial purpose of encouraging its design. Not only are we convinced of its absolute importance as a type, but we feel still more certain that until it arrives and until the military authorities feel that they have a machine that they can use with effect, there will not take place that expansion of policy which is so desirable from every point of view. Thus, let it not be forgotten that the Royal Flying Corps consists of seven squadrons, each of which is supposed to represent an effective flight of twelve aeroplanes. The actual total number in use and for which proper equipment is supposed to be provided under the present scheme is 84 aeroplanes. Add to these another 84 in reserve, and we have 168 machines as a reasonable basis for the conduct of the present scheme. It is evidently all important, therefore, that the scheme as such should not only be put on a proper footing without delay by the expenditure of the necessary capital outlay, but that all haste should be made towards the perfection of a more evolved type of military machine such as will cause the authorities to look with greater favour upon the expansion of military aeronautics.

It is quite a reasonable proposition that aeroplanes might play a rôle of first-class importance in that much debated study of coast defence. We believe that there are diametrically opposed schools of thought on the subject of coast defence, some believing that it is the proper duty of one branch of the service, while others think differently. It would surely be a very happy solution to the situation, therefore, if the work itself could be adequately accomplished by the new aerial arm, and as soon as a scheme of this magnitude is entered upon, constructors of warlike flying machines should begin to experience a period of record activity.

Finally, we would touch upon a subject that is perhaps more vitally important at the moment than any other—the development of a satisfactory British-built aero engine. Thus far the Gnome rotary engine has been responsible to all intents and purposes for the development of aviation to its present state of perfection. Everyone would, however, prefer, so far as we can gather, to have an engine of the non-rotary type. There is, without question, an enormous business to be done by any British constructor who can turn out a first class engine of about 100 h.p., but it must be thoroughly reliable and not too heavy, it must hold its power output constantly and it must not shake. At one time we thought it would be a very good idea if the Government set aside £20,000 or so for a prize for engines, but already we think there is a far better prize to be won by way of actual orders. Anyone who has such an engine has a very straightforward course to pursue. There is a very useful testing plant down at the Royal Aircraft Factory, where they can test their engines as long and as severely as they please. One hears much of the wonderful things that engines can do on the bench, and a bench test at the R.A.F. is just the sort of thing that the authorities appear to like, so for once there should be a firm agreement between the maker and the prospective user as to the real standard of the results.



AT OLYMPIA SHOW.—The 70-h.p. Bristol biplane, as seen from the side.

The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

ANNUAL DINNER.

The ANNUAL DINNER will take place at the ROYAL AUTOMOBILE CLUB, PALL MALL, S.W. (by kind permission), on THURSDAY, MARCH 13th, 1913, at 7.30 for 8 o'clock.

(Since circularising the members it has been found necessary to alter the date from March 6th to 13th.)

In order to facilitate the arrangements, Members are requested to notify the Secretary as early as possible, if it is their intention to be present, and at the same time give the names of their Guests, if any.

Members may be accompanied by Ladies.

Tickets (exclusive of Wines and Cigars)—15s. each.

The following prizes won during the year will be presented :—

The British Empire Michelin Trophy No. 1, to H. G. Hawker.

The British Empire Michelin Trophy No. 2, to S. F. Cody.

An entertainment will take place after the Dinner.

INTERNATIONAL AERO SHOW AT OLYMPIA.

The International Aero Show organised by the Society of Motor Manufacturers and Traders, supported by the Royal Aero Club, is now being held at Olympia and will remain open until Saturday, the 22nd inst.

Members of the Royal Aero Club are admitted free on presentation of their membership cards.

A room in the Princes' Gallery will be placed at the disposal of the members during the exhibition.

An invitation has been extended by the Royal Aero Club to the Non-Commissioned Officers and Men attached to the Naval and Military Wings of the Royal Flying Corps to visit the Exhibition on Saturday, the 15th inst. This invitation has been accepted by the War Office and the Lords Commissioners of the Admiralty on behalf of 50 Non-Commissioned Officers and Men of the Military Wing and 25 Petty Officers and Men of the Naval Wing. During the visit the men will be entertained to luncheon by the Royal Aero Club.

Annual General Meeting.

The Annual General Meeting of the Members of the Royal Aero Club of the United Kingdom will be held on Wednesday, March 19th, 1913, at 4 o'clock, at 166, Piccadilly, London, W.

Notices of motion for the Annual General Meeting must be received by the Secretary not less than twenty-one days before the meeting, and must be signed by at least five members. Wednesday, February 26th, 1913, is the last day for the receipt of notices of motion.

Committee.

In accordance with the rules, the Committee shall consist of eighteen members. Members are elected to serve for two years, half the Committee retiring annually. Retiring members are eligible for re-election.

The retiring members of the committee are :—

Griffith Brewer.	Prof. A. K. Huntington.
Capt. Bertram Dickson, R.F.A.	F. K. McClean.
John D. Dunville.	Alec Ogilvie.
Col. H. C. L. Holden, C.B., F.R.S.	Mervyn O'Gorman.
	C. F. Pollock.

Any two members of the Club can nominate a member to serve on the Committee, having previously obtained such member's consent. The name of such member so nominated, with the names of his proposer and seconder, must be sent to the Secretary in writing not less than fourteen days before the Annual General Meeting. Wednesday, March 5th, is the last day for the receipt of nominations.

The following members have so far been nominated :—

Griffith Brewer.	F. K. McClean.
Ernest C. Bucknall.	M. O'Gorman.
Col. H. C. L. Holden, C.B., F.R.S.	C. F. Pollock.

Members are reminded that a ballot paper for the election of nine candidates to seats on the Committee of the Club will be forwarded to them at least seven days before the date of the Annual General Meeting.

Gordon-Bennett Aviation Cup.

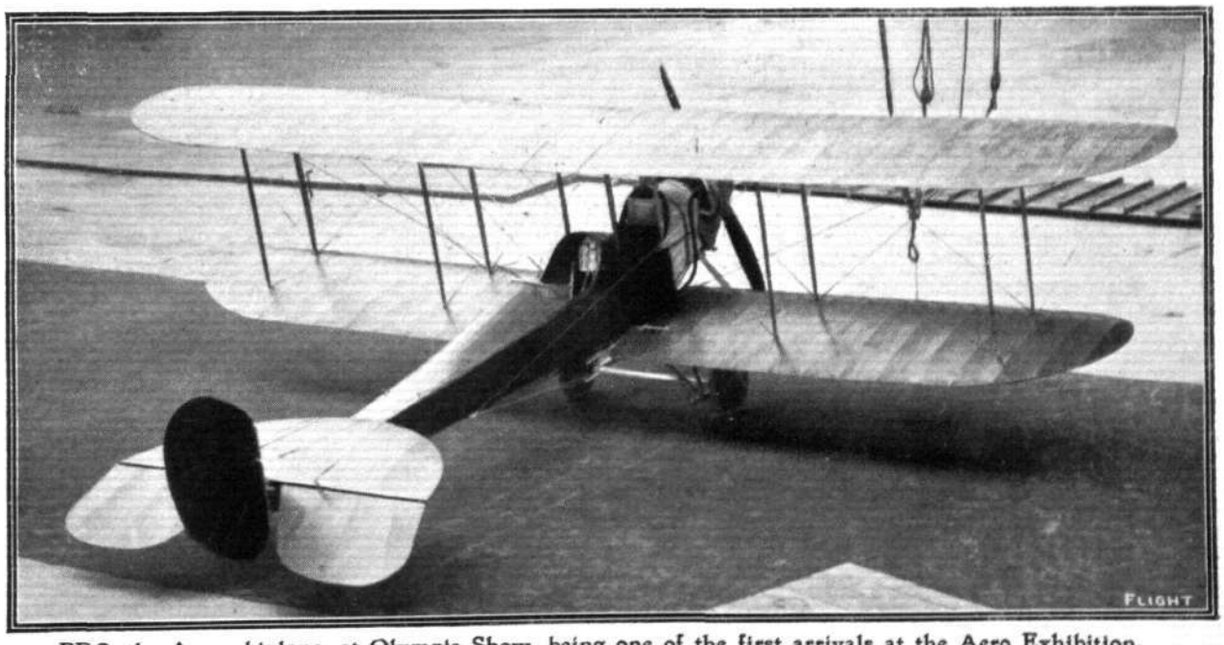
The cup having been won by a representative of the Aero Club de France, the race for 1913 will take place in France. The exact time and place will be announced later.

The race will be a speed contest for a distance of 200 kiloms. over a course of not less than 5 kiloms.

Each club affiliated to the Fédération Aéronautique Internationale has the right to challenge the holder, the Aero Club de France, and such challenge must be sent in before March 1st, 1913.

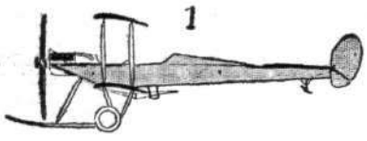
The Committee of the Royal Aero Club will select the three competitors to represent the British Empire, and intending candidates are requested to notify the Secretary on or before February 25th, 1913, of their willingness to compete, if chosen. Applications must be accompanied by a cheque for £20, the entry fee, which amount will be returned should the entrant not be selected.

166, Piccadilly. HAROLD E. PERRIN, Secretary.

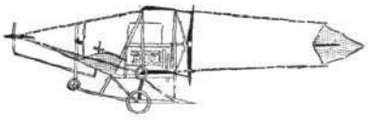


BE 2, the Army biplane, at Olympia Show, being one of the first arrivals at the Aero Exhibition.

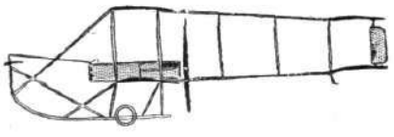
THE OLYMPIA AERO



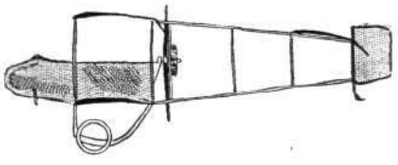
THE 70HP. BE2 BIPLANE



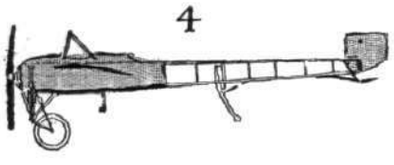
THE 120HP. CODY BIPLANE



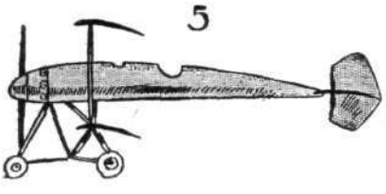
THE 70HP. M. FARMAN BIPLANE



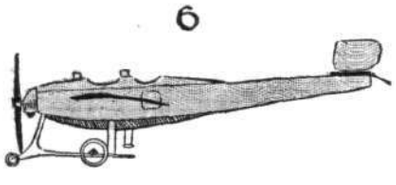
THE 80HP. H. FARMAN BIPLANE



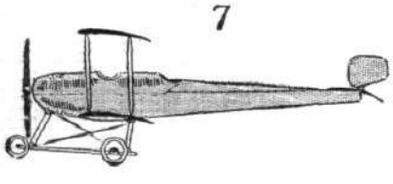
THE 80HP. BLERIOT MONOPLANE



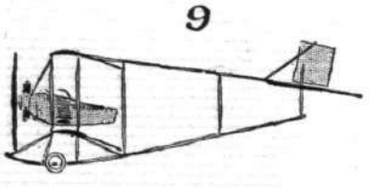
THE 85HP. BREGUET BIPLANE



THE 80HP. BRISTOL MONOPLANE



THE 70HP. BRISTOL BIPLANE

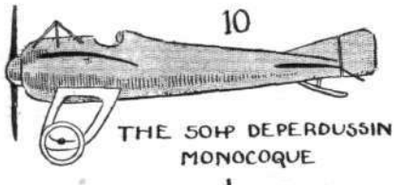


THE 35HP. CAUDRON BIPLANE

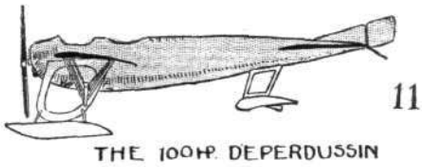
TABULATED PARTICULARS OF

	Machine.	Type.	No. of seats.	Dimensions.				Max. speed.	Weight.		Construction.	Landing gear.
				Length.	Span. Upper.	Span. Lower.	Area.		Machine.	Useful load.		
				ft.	ft.	ft.	sq. ft.	m.p.h.	lbs.	lbs.		
1	BE2	Biplane ...	2	29½	38½	35	374	—	—	—	Wood; steel	Wh. ; S.
2	Cody	,, ...	4	38	43	43	483	75	1900	1000	Wood ...	,,
3	Avro	,, ...	2	29	36	36	360	62	900	600	,, ...	Wh. ; C.S.
4	Blériot... ...	Monoplane ...	2	27	31	—	198	75	800	550	,, ...	Wh.
5	Breguet ...	Biplane ...	2	29½	45	39	337	67	1430	660	Steel ...	,,
6	Bristol... ...	Monoplane ...	2	28	43	—	248	71	1050	726	Wood; steel	Wh. ; S.
7	,, ...	Biplane ...	2	27·5	38	38	440	62	946	880	,,	,,
8	Caudron ...	Monoplane ...	1	21	25	—	105	85	500	280	,,	Wh.
9	,, ...	Biplane ...	1	20	35	21	244	48	500	300	Wood ...	Wh. ; S.
10	Deperdussin ...	Monocoque ...	2	23	34	—	215	66	950	600	,, ...	Wh.
11	,, ..	Hydro-mono. ...	2	27	42	—	290	70	1150	1850	,, ...	Floats
12	Farman, H. ...	Biplane ...	2	26½	—	—	376	65	720	600	,, ...	Wh.
13	Farman, M. ...	,, ...	2	39	51	37	520	55	1270	600	,, ...	Wh. ; S.
14	Grahame-White	,, ...	3	33¾	42½	29¾	440	70	2200	750	,, ...	,,
15	,,	Hydro-biplane	2	25	42½	24	335	55	850	450	,, ...	Floats
16	Handley Page...	Monoplane ...	2	28	42	—	240	55	850	450	Wood; steel	Wh. ; C.S.
17	Martinsyde ...	,, ...	2	35	42¾	—	285	70	500	300	Wood ...	,,
18	Nieuport ...	Hydro-mono....	3	29	40	—	242	65	123	600	Wood; steel	Floats
19	Samuel-White	Hydro-biplane	2	30	44	40	500	70	1350	650	,,	2 Floats
20	Short (P. Grace)	,,	3	35	48	30	390	65	1200	771	Wood ...	Floats
21	Sopwith ...	,,	2	30	41	41	422	65	1200	500	,, ...	Float
22	,, ...	Biplane ...	3	29	40	40	365	70	1000	750	,, ...	Wh. ; S.
23	Vickers ...	Monoplane ...	2	—	35	—	225	63	—	—	Steel ...	,,
24	,, ...	Biplane ...	—	—	40	30	385	—	—	—	,, ...	,,

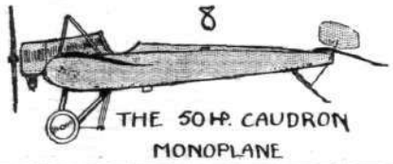
C.S. = Central skid. S. = Skids. Wh. = Wheels.



THE 50HP DEPERDUSSIN MONOCOQUE



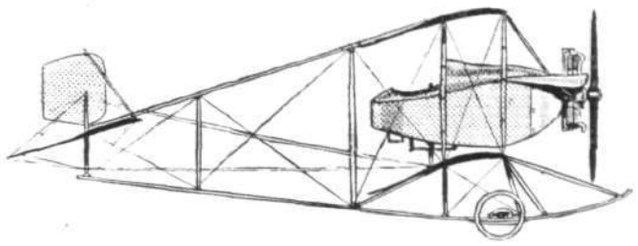
THE 100HP. DEPERDUSSIN HYDRO-MONOPLANE



THE 50HP. CAUDRON MONOPLANE

are hinged to the body of the machine by a steel joint that is shown in one of our sketches.

The landing gear carries two rolling wheels which are mounted on axles radiating on either side from the centre V of the chassis. Each axle is sprung at a point near the wheel by rubber cord which passes under a crutch formed at the junction of two ash struts in V. The illustrations we publish will make this point clear. A small tail skid is fitted. There is a curious point regarding the "set" of



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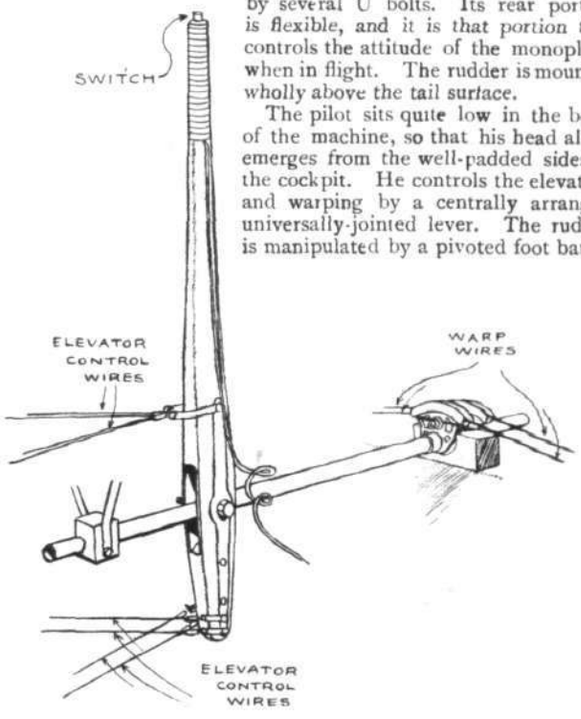
The 35-h.p. Anzani-Caudron biplane.

the rolling wheels. Their axles are set back at a small angle behind the line at right angles to the rolling path, a feature, it is claimed, by which any tendency of the machine to veer, when rolling, to either side of its straight path, is removed.

The tail has an area of 29 sq. ft., and is clamped to the *fuselage* by several U bolts. Its rear portion is flexible, and it is that portion that controls the attitude of the monoplane when in flight. The rudder is mounted wholly above the tail surface.

The pilot sits quite low in the body of the machine, so that his head alone emerges from the well-padded sides of the cockpit. He controls the elevation and warping by a centrally arranged universally-jointed lever. The rudder is manipulated by a pivoted foot bar.



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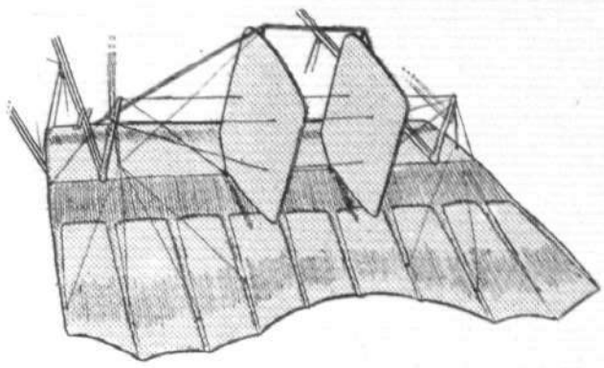
Sketch illustrating the control and its attachments on the Caudron biplane.

The 35-h.p. Caudron Biplane is a machine that is becoming increasingly popular. The small model similar to the one shown at Olympia, is chiefly used for instruction work, although many similar ones are privately owned. They are quite inexpensive to buy, and are not by any means difficult to handle, as machines go. The French army own several of this type and use them for instruction purposes As well, of course, they have many of higher engine power, which are used for more serious work. There is at present under test at Farnborough one of these machines fitted with a 70-h.p. Gnome motor which we are inclined to believe has given very good results. In a wind they behave extremely well, for the rear portions of the planes are very flexible, thus allowing the machine to ride through a gusty wind with a certain smoothness, in the same manner as a well-sprung car may travel over a rough road



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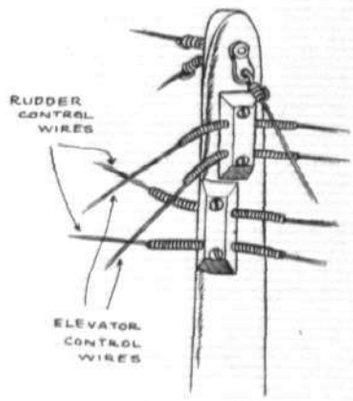
Tail of the Caudron biplane.

surface without the jars being particularly noticeable to those seated inside.

The planes span 30 ft. and 23 ft. 3 ins. respectively, and have a chord measurement of 4 ft. 6 ins. They are separated by 12 stanchions and braced strongly with piano wire. As in the monoplane, the main spars are placed only about 18 ins. apart. The ribs are cut from French poplar and overhang the rear spar nearly 3 ft., forming the flexible trailing edge that we have referred to above. Warping is employed to correct lateral equilibrium.

The body is a small coracle-shaped structure built up in the same manner as a monoplane *fuselage*. The front is capped by a steel plate, and to this the motor is bolted. Subsidiary supports, in the form of steel tubes support the front of the crank case. The remainder of the body is covered in by fabric to give it a fair streamline shape, and to help shelter the pilot from the wind. The body of the machine at Olympia is fitted with a superstructure that covers in the fuel tanks and acts as a very convenient wind shield. Seated comfortably inside, the pilot has between his knees a vertical jointed lever by which he controls the warping and elevation of the machine. The twin rudders are worked from a foot bar.

The tail is a flexible monoplane surface supported by ash outriggers. A peculiarity of this outrigger construction is, that the lower outrigger members continue forward underneath the machine to form the landing skids. While simplifying the construction considerably, this system has the advantage that these lower outriggers can be made to drag heavily along the ground at the completion of a flight, thus bringing the machine quickly to rest. Again, they are very useful for holding the machine back while the engine is tested, perhaps a minor point, but nevertheless one that is greatly appreciated by the mechanics that attend the machine. They merely have to stand on these outriggers and the outriggers themselves do the rest.



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How control wires are led to the various tail organs through flexible guide tubes on the Caudron biplane.

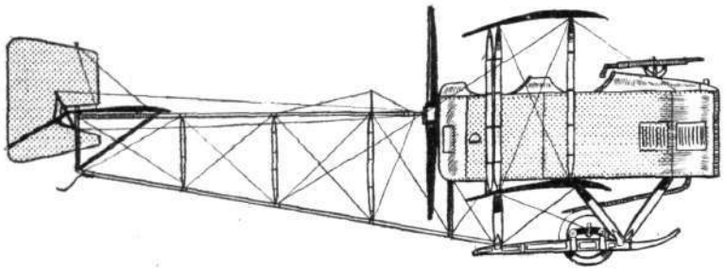
The landing gear is formed by strapping Farman-type wheel units over these outrigger members we have referred to above. Being quite low the chassis is very strong compared with its weight. It is a very ordinary affair—but what matters, it completed the greatly feared rolling test at Farnborough at the first time of asking, without any damage, and there are very few machines that can boast of having done that.

GRAHAME-WHITE AVIATION CO., LTD.

Two notable biplanes figure on their stand, one a 90-h.p. military machine, and the other a hydro-biplane of a sporting type, driven by a 60-h.p. Anzani motor. Both bear evidence of much thought on the part of the designers, and of much painstaking care spent upon them in the constructing shops. The design of the first of these machines was due originally to Mr. H. Barber, but in its working out he was assisted by Mr. J. D. North, who also prepared the drawings for the hydro-biplane. Let us confine our attention for the moment to the military machine.

The Grahame-White Military Biplane, as its title conveys,

is a machine specially devised for military purposes, and particularly so that its occupants may be able to undertake offence tactics. So that the occupants may have a clear outlook in front of their respective cockpits, the propeller is arranged to the rear, while by



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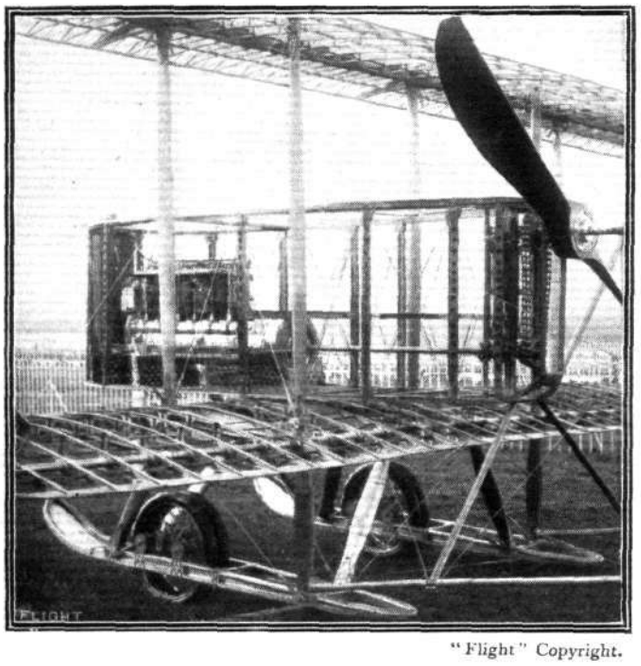
The 90-h.p. Grahame-White military biplane.

using shaft drive the front engine position is retained, a disposition of the motor that is generally thought to be the best from the point of view of the passengers' safety. This machine was originally designed for a motor of 120 h.p., but it appears at the Show



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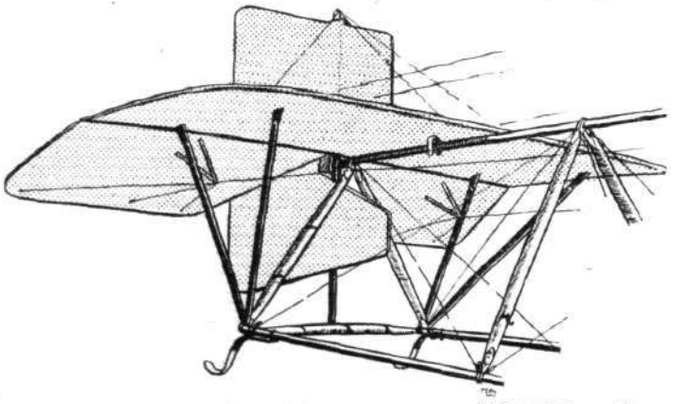
This photograph of the 90-h.p. Grahame-White military biplane gives a good idea of the intricacy of its internal construction.

temporarily fitted with one of only 90 h.p. To illustrate its application as an aeroplane for attack purposes, a Colt quick-firing gun is mounted in the nose of the machine, and it has a range of 50° in a



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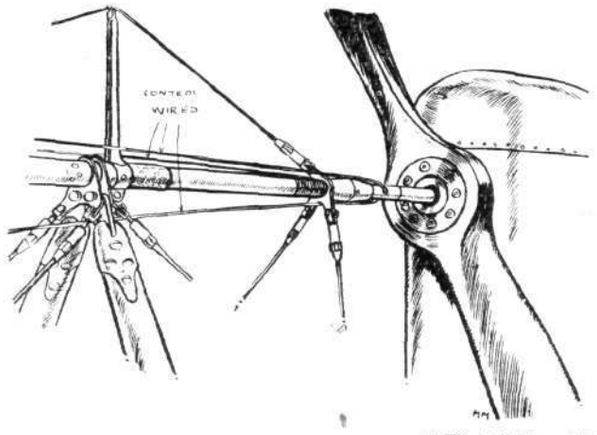
The tail of the 90-h.p. Grahame-White military biplane.

vertical plane, and 180° horizontally. It would, of course, be impossible for the gunner to make use of the gun's full extent of horizontal range—he would probably only be able to sight it through a deviation of 45° on either side of the longitudinal axis of the machine.

The body of the biplane is essentially a lattice girder with ash *longerons*, and ash and spruce cross-members, ash being used for the latter members in the neighbourhood of the engine and propeller. That perfect rigidity may be assured, and this is doubly essential in the case of the body of this particular machine on account of its having a transmission shaft mounted inside it, it is double cross-braced with 10-gauge piano wire. In plan, the body is shaped to a careful streamline form, and it is an interesting point that the strut cross-sections are of the same shape, excepting that their curves are plotted to a shorter longitudinal axis. The Austro-Daimler motor is mounted on high ash bearers in front, and drives the propeller, a 10 ft. Chauvière, through shaft and chain transmission. The shaft is a large diameter steel tube running in self-aligning ball-bearings, and the chain employed is a duplex Brampton. Fitted at the extreme nose of the body is a honeycomb radiator, specially made by the Austro-Daimler firm, and so shaped that it preserves the lines of the body. There is room on either side of the engine for a passenger to sit. They are provided with unusually comfortable spring seats, while under their feet are tool boxes. The pilot sits behind them and controls the machine by a vertical lever governing the elevation and wing warping, and by a pivoted foot lever which operates the rudder. To ensure sweet working, all the controls are carefully mounted on ball-bearings, and all the pulleys used to guide the control wires are turned from vanalium and fitted with ball-bearing centres. Below the pilot's feet is a



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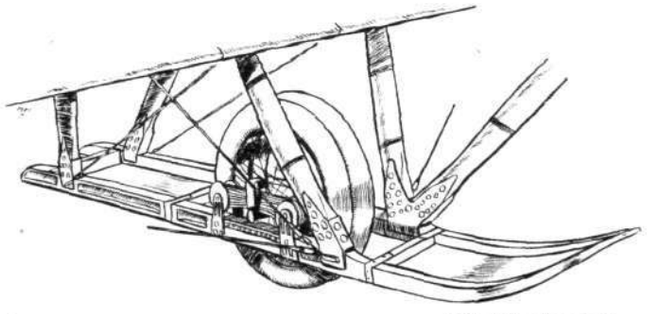
The propeller mounting of the 90-h.p. Grahame-White biplane. Notice the manner in which the control wires are taken through the top member of the tail outrigger construction which passes through the propeller boss.

large petrol tank sufficient for a 6-hours' flight. From that tank, petrol is fed under pressure, automatically provided by the engine exhaust, to a service tank in front, above the level of the engine. The pilot can at all times acquaint himself as to the state of his petrol supply by a specially devised gauge on his left.

Plane construction.—The planes span respectively 42 ft. and 23 ft. and, having a chord measurement of 6 ft., they have a supporting area of 390 sq. ft. The cross-section employed is that of the Eiffel plane No. 8. The interior construction of the plane is



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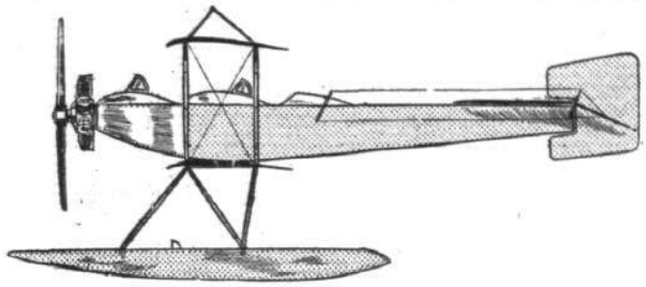
Details of the landing chassis of the 90-h.p. Grahame-White biplane, showing how the double-tyred wheels are sprung in the wide built-up landing skids.

particularly interesting. The front span is of generous dimensions, shaped from spruce. The rear span is a wide diameter steel tube. Over the spars are loosely fitted the ribs in such a manner that continual warping of the planes does not fatigue the structure. The ribs are built up of spruce webs and flanges, and where the spars are threaded through them they are thickened up to the full width of the flanges. To strengthen the planes against drift, they are cross-braced inside with $\frac{5}{32}$ in. stranded cable, and so that the tension of the braces shall not cause the spars to pull together and so bind the ribs, they are separated by adjustable steel rods.

The landing gear is composed of two built-up skids, each a little over a foot wide, in the centres of which are mounted the



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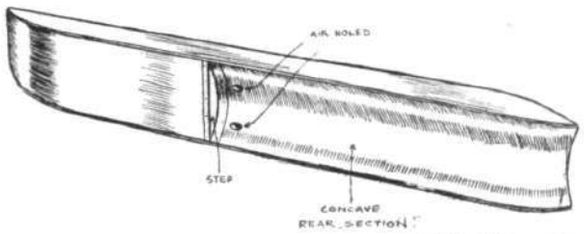
The 60-h.p. Grahame-White hydro-biplane.

landing wheels. These latter organs each have two rims to the one wheel and are so designed to prevent the wheel from canting over sideways, which is, with a single tyre wheel, a very likely thing to happen with the method of suspension used. One of our sketches illustrates this point. The body of the machine is supported from the skids by 10 hollow spruce struts, the front two of which are taken straight to the engine bearers.

The tail, consisting of a flat stabilizing surface 50 sq. ft. in area, two elevator flaps of a combined area of 25 sq. ft., and a vertical



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The Grahame-White float, as seen from underneath. Notice that the front section is flat on the underside, while the rear portion is concave.

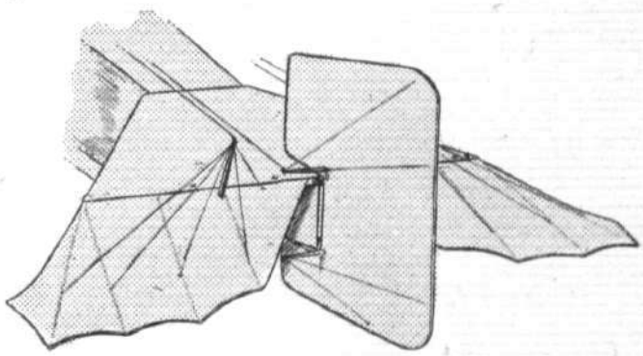
rudder of 20 sq. ft. surface, is stayed at the end of an open girder construction, built up of three steel tubular *longerons* and hollow spruce struts. The top member of this girder, as will be seen from our sketches, passes through the propeller boss.

The Grahame-White military biplane weighs, without passengers or fuel, 2,100 lbs., and is designed to carry a useful load of 750 lbs. With her 120-h.p. engines fitted, she is expected to have a speed range of from 50 to 70 miles per hour.

The 60-h.p. Grahame-White Hydro-biplane is a machine designed to satisfy the demands of the sportsman who is inclined to take up water flying and who does not necessarily want to be put to too great an expense in gratifying his hobby.

The body of the biplane, a conventional girder structure, is capped by a flanged steel plate which serves as a mounting for the motor. To strengthen the last bay of the *fuselage* to withstand the vibration of the engine, it is cross-braced with $\frac{5}{8}$ in. steel tubing. The body construction is interesting in that it is so simple, so cheap to construct, and forms so sound a "job." Four ash *longerons* are used. The vertical members of the body are of ash or spruce, according to the strains to be allowed for, while the horizontal cross-members are of steel tubing, a material which permits of a very simple cross-bracing fitting being employed. Immediately behind the motor sits the passenger, sheltered from the engine blast by a transparent wind shield. At his back is the main fuel tank, which holds sufficient petrol to keep the machine flying for four hours if need be. Behind that is the pilot's cockpit, very comfortably upholstered. Both pilot and passenger are so seated that they each have a perfect vertical view downwards. The controls are operated by a universally-jointed lever and foot rudder bar in a manner identical to that of the 90-h.p. G.-W. machine.

The planes span 42 ft. 6 in. and 22 ft. 6 in. respectively, and have a chord measurement of 5 ft. In cross-section they are similar to the wing of the later 50-h.p. Gnome-Blériot monoplane. For the internal construction of the planes, the front spar is of I section ash, while the rear spar, reinforced by a steel strip, is also of ash, but left solid as it is necessarily of lesser dimensions. Where vertical struts join the spars, the ribs are of the Farman box variety. In other parts of the plane, they are built up of spruce flanges and 3-ply webs. The extensions to the top plane are 10 ft. in length and they are hinged to the central *cellule* that they may be folded down when the machine is stored. Lateral balance is governed by long compensating *ailerons*, hinged to the backs of these extensions. Twelve struts separate the planes, the four centre ones, which support the body, being of ash, while all the others are of hollow spruce.



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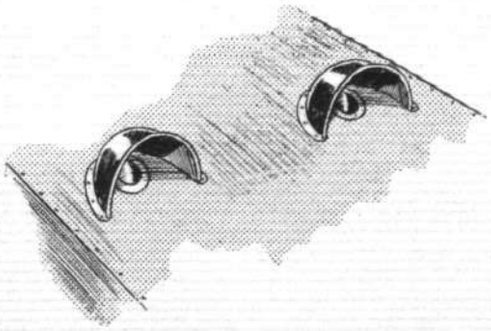
The tail of the Grahame-White hydro-biplane.

Floats.—Two main floats which have a "track" of 12 ft. 6 ins., are employed to enable the machine to alight on and start off from water. They are each 15 ft. long and measure at their maximum cross-section 24 ins. wide by 15 ins. deep. A feature of their design is that the first half of the float is flat on the under-surface while the rear portion is concave, having a maximum camber of 4 ins. Air is projected below the after portion of the floats, so that the machine may glide the more easily over the water, by tubes, about 2 in. in diameter, into which air is forced by miniature scoops (see diagram). The skeletons of the floats are latticed girders of spruce and ash. They are covered in the following manner:—First, a number of strips



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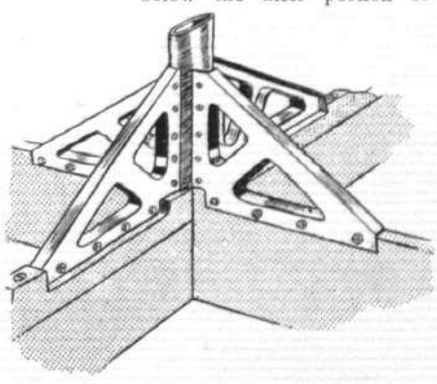
The air vents in the float of the Grahame-White hydro-biplane.



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Sketch showing how the chassis struts are attached to the interior float construction on the Grahame-White hydro-biplane.

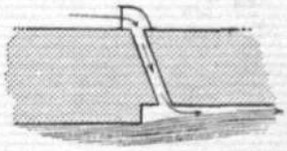

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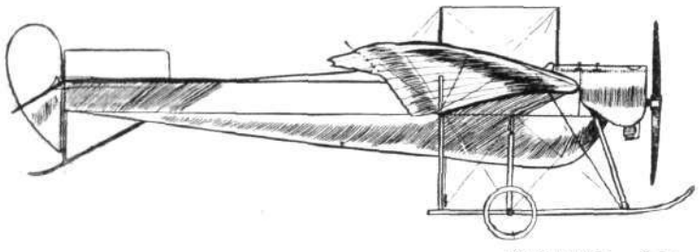
Diagram of the air inlet pipe of the Grahame-White floats.

of cedar, 4 in. wide and $\frac{3}{32}$ in. thick are applied to each side at an angle of 45° to the longitudinal axis of the float. These strips in position, they are coated with copal varnish, and while that is still wet a layer of waterproof canvas is put on. This is again varnished and a further layer of cedar veneer applied, making the strips run this time in a direction 90° to the former layer. The floats are finished off by copper nails, which are driven in every two inches or so all over the floats and clinched over. Then, to protect the under-surface, longitudinal ash stringers are applied.

Six steel struts, spruce filled, of special streamline section support the body of the machine. The struts are bedded in the float structure on to the spruce main skeleton, and they are reinforced at the point of attachment by flanged steel plates (refer sketch). Floats built on this principle do not come out unduly heavy. These Grahame-White floats weigh less than 100 lbs. each complete with struts and wiring. Without passengers or fuel the machine weighs 850 lbs., and is capable of carrying a useful load of 450 lbs. The machine's flying speed is expected to average 55 m.p.h.

MESSRS. HANDLEY PAGE, LTD.

The 50-h.p. two-seater monoplane exhibited on this stand is now more than a year old. Although it is in such excellent condition,



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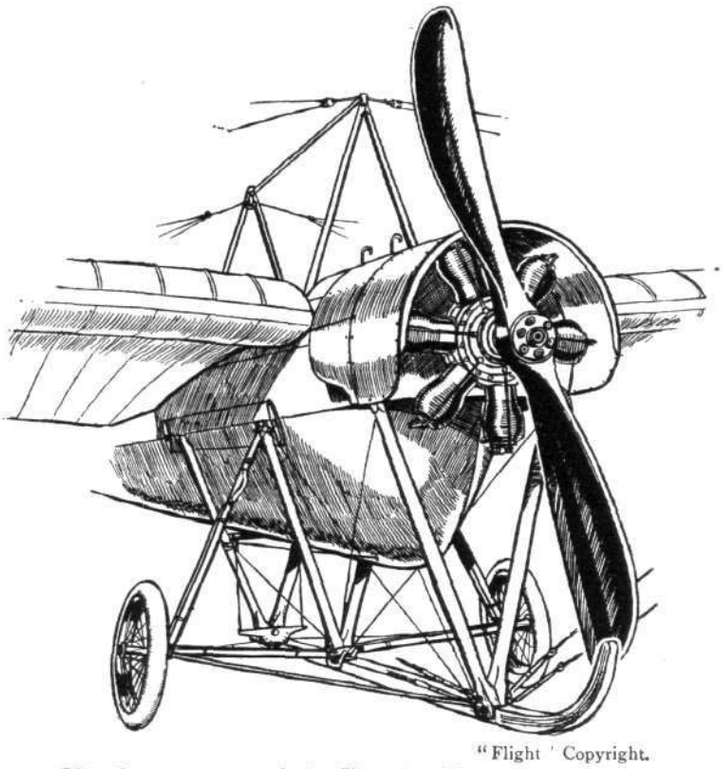
The 50-h.p. Handley Page monoplane.

thanks to the renovation it has undergone at the Handley Page works previous to being brought to Olympia, one would scarcely think to look at it that it had been in existence so long. But the fact that it has had severe use does not make it any the less interesting as an exhibit—rather the reverse. It has the distinction of being the only machine that has, so far, flown from one side of London to the other, following the course of the Thames. This was accomplished when the late Mr. Edward Petre flew it last year, from the old Handley Page testing grounds at Fairlop to Richmond and then on to Brooklands. During its lifetime the machine has flown upwards of 2,000 miles and has carried over a hundred passengers at different times.

The 50-h.p. Handley Page monoplane.—To the semi-interested spectator, the first point that catches the eye is the unusual gull-like shape of the wings. Probably many an onlooker will think that they have been shaped in this way for the sake of artistic effect. This, however, is not the case. A much more important consideration underlies their design. They are shaped thus in order that the machine as a whole may be, to a great extent, automatically stable in the air. And the intentions of the designer have been borne out by practical test with the machine, for it has accomplished many trips in high winds, keeping so steady that the pilot has scarcely ever been called upon to use the controls at all. Struck by a forward or a rearward gust, the machine will rise or fall bodily on a level keel as the case may be. A side gust will have the effect of making the machine roll slightly, but the machine, without any help from the controls at all, always returns automatically to its normal level attitude by virtue of the shape of its wings. Considering that the machine is only fitted with a 50 Gnome motor, its performances to date have been remarkably good, for it is not often that one can get a monoplane to fly so well as the Handley Page machine does, and carry a passenger and quite a considerable fuel supply, with an engine of such relatively low horse power. As a further consideration, it must be borne in mind that the machine in question does not come under the category of light monoplanes. Being considered an experimental machine at the time when it was built, no efforts were made to cut down weight. As the machine stands at present, it turns the scale at 850 lbs., but on further machines of this type, Mr. Handley Page calculates that 100 lbs. weight can be saved, without in any way weakening the strength of the structure.



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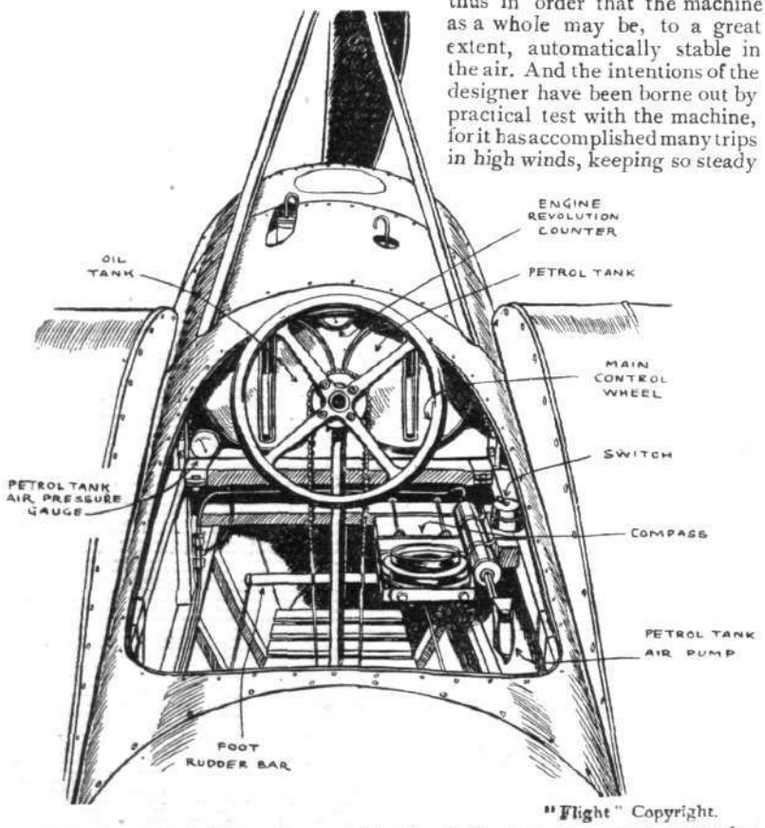
The front section of the Handley Page monoplane.



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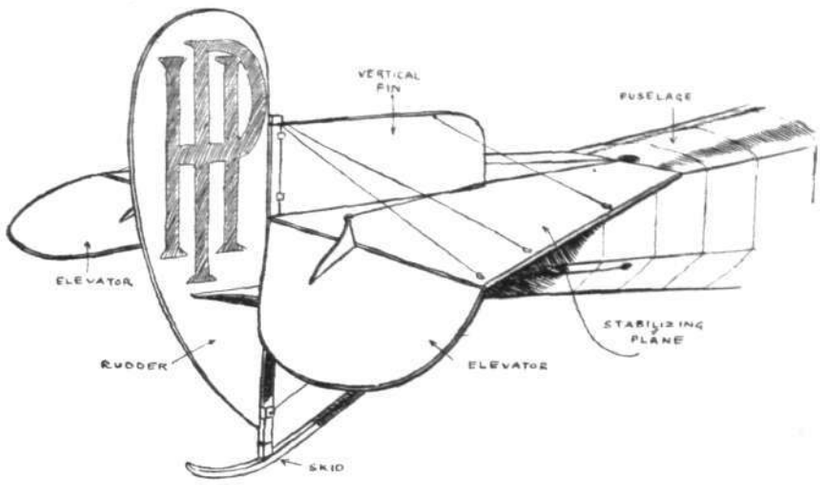
Handley Page Monoplane.—Sketch of the interior of the pilot's cockpit, as seen when standing up in the passenger's seat.

The fuselage is a rectangular section box girder, having ash longitudinal members, and cross and vertical members of spruce and ash, ash being used at those points of the body where the greatest strains have to be borne. The body is brought to a pentagonal section by the application of a triangular keel to the base of the lattice girders. The girder of rectangular section, however, takes the whole of the body strain, the keel being added simply to improve the appearance of the machine and to reduce its head resistance. Protruding from the front of the body is a 50-h.p. Gnome motor, which is not supported by any bearing in front of the crank case. It revolves under an aluminium cowl, which prevents oil from being scattered broadcast by the engine. The wing spars are housed by two boxes suitably arranged on either side of the machine for that purpose, and strong ash struts are carried laterally across the body in their neighbourhood, to take the compression that is always existent in a structure of this type.

The wings, as we have remarked, are gull-shaped, that is, they have a crescent-shaped entering edge, and there is a graduated



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The tail of the Handley Page monoplane.

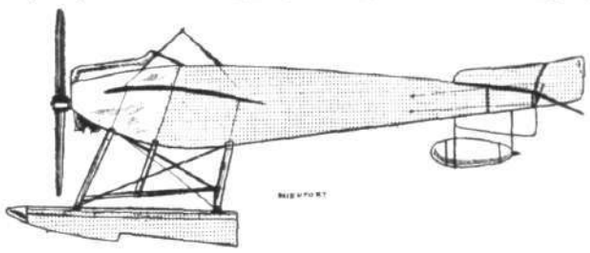
wash-out from root to tip, the tip being swept back and adjusted incident to the relative wind at a negative angle of incidence. The wing spars are both of ash, the front one being of I section and about 9 in. deep at the root. The rear spar is more of an H section, for the thickness of the wing is not so great where it is built into the structure. They are so designed that in no place will they be called upon to withstand a greater strain than 1,000 lbs. to the square inch. In their construction the ribs must have been the most difficult part of the whole machine, for, as the wing curve varies progressively from root to tip, every rib has a different camber and chord measurement. Solid Honduras mahogany ribs occur at every few feet along the spars, and the plane sections between these ribs are kept accurately shaped by false ribs of silver spruce. Longitudinal stringers also help to maintain the correct shape of the wings. The fabric is sewn on diagonally, and on the top surface, where the greater lift occurs, is very strongly attached by having cane strips tacked over it on to the ribs. The wings are stayed above and below by two strong stranded steel cables to the front spar, and three to the rear. A factor of safety of 14 is worked to in their design.

The landing gear consists of a central skid of ash, supporting the body by six ash struts set in three pairs and arranged V-fashioned, as one of our sketches shows. The wheels are mounted on axles, which are universally jointed to a fitting at the base of the middle chassis V, and, from a point near the wheel the body is supported on either side by a compression spring strut. The main lift wires from the wings are attached to a fitting which passes below the front pair of chassis struts.

In the interior of the fuselage there is seating accommodation for two, arranged in tandem, with the pilot in front. A good impression of the pilot's seat can be obtained from one of the accompanying sketches. Since that sketch was obtained, however, a supplementary instrument has been fitted, a Stolz electrophone to wit, which enables the pilot and passenger to carry on a conversation unhindered by the noise of the engine. An American, Mr. Hammer, is the inventor of this device. Throughout, the machine is treated over with Robbialac varnish. Weighing 850 lbs., the machine is capable of raising a useful load of 450 lbs. and of flying at a speed of 54 miles per hour. In future machines of this type, a flying speed of 58 miles per hour will be obtained with the same engine power.

SOCIÉTÉ ANONYME DES ÉTABLISSEMENTS, NIEUPORT.

ON exhibition on their stand, this well-known French firm of monoplane constructors have a 100-h.p. Gnome engined hydro-monoplane, the identical machine that was shown at the last Paris Aero Show. As we remarked in last week's issue four machines similar to this one have been supplied to the French Navy and three to the Japanese Navy. This model has been very successful at various hydro-aeroplane meetings. At the St. Malo *concours* M. Weymann, flying one of these machines gained the Grand Prix of the meeting by his flight from St. Malo to Jersey and back. It also holds, we believe, the record for having flown the longest distance over water. At the close of the Tamise meeting in Belgium, Weymann flew his mount to Vernon in France, touching at Antwerp, Calais, and Le Havre *en route*.



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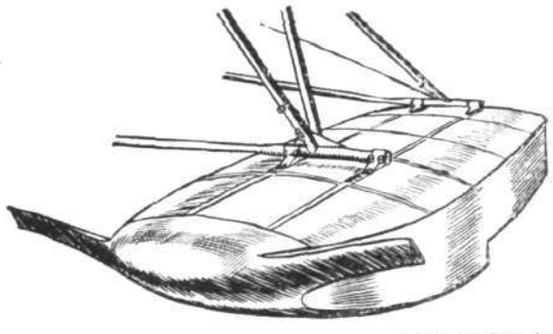
The 100-h.p. Nieuport hydro-monoplane.



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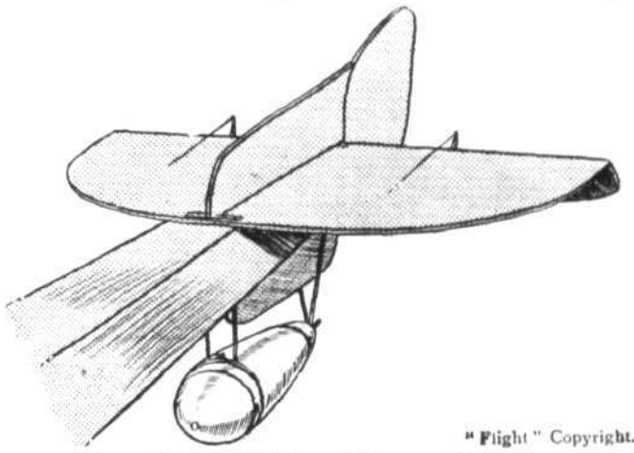
Details of the front of the Nieuport float, showing the peculiar fin-like projections in front which prevent the float from burying itself in rough water.

The 100-h.p. Nieuport Hydro-monoplane. — In its general build this machine is not a great deal unlike the various Nieuport monoplanes that are at present flying in this country, excepting, of course, that it has floats in place of a wheeled undercarriage.



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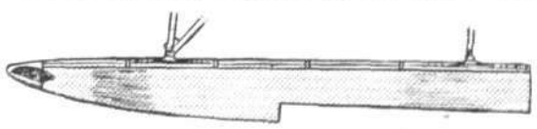
The tail of the 100-h.p. Nieuport Hydravion.

The body is 29 feet in length and of an approximate streamline shape, viewed from the side. In its construction it is slightly different from the bodies that are used on land machines, in that, whereas the bodies of the latter type are constructed entirely of wood, the body of the hydro-monoplane uses steel struts for the vertical members of the lattice girder. In front, mounted on triple bearers is the 100-h.p. Gnome motor direct coupled to an Integral propeller which has armoured tips to prevent it smashing if struck by spray. Immediately behind the motor sits the pilot, who controls the machine by a system of levers similar to those used on all Nieuport machines. The rudder and elevator are operated by a single vertical central lever, while the wing warping is controlled by



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Side elevation of the Nieuport float.

the feet. Before him, on a dashboard, is mounted a complete set of instruments useful in cross-sea work. Lower down in the cockpit there is a starting handle by which the pilot may put the motor in operation without exterior help. Behind the pilot are seats for two observers arranged side by side.

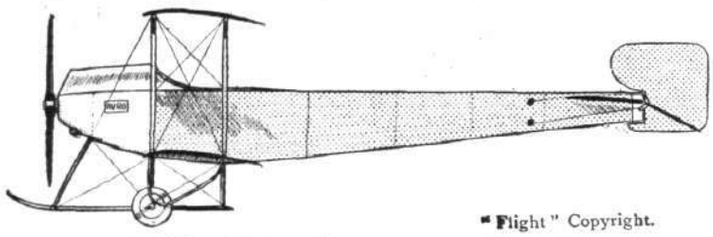
The alighting gear, designed by Lieut. Delâge of the French Navy, consists of two main floats below and slightly forward of the centre of gravity and a small elongated egg-shaped float which supports the tail. Cypress is the wood used for the construction of the main floats, the tops of them being covered in with Willesden canvas. On either side of the nose of each main float, a curiously-shaped fin projects. They are designed to prevent the float burying in a heavy sea and also to assist in keeping spray clear of the propeller. The main floats have a single step which occurs about half way along their length. They support the body through a structure of steel tubing of streamline section.

The tail of the machine is of the usual Nieuport type, with the exception that, presumably to counterbalance the extra resistance to a side wind offered by the floats, two small vertical tail fins have been added, one above the stabilizer and the other below. There is no need to describe the wings in detail for, except that they span 40 ft., they are standard in every respect. The machine, without fuel or passengers weighs 1,230 lbs., travels at 65 miles an hour, and can be bought for £2,000.

A. V. ROE AND CO., LTD.

They are exhibiting a

50-h.p. Avro biplane, fitted with a Gnome engine, and arranged to carry a passenger. Similar machines to the one shown have been supplied in numbers to the Royal Flying Corps, and we have heard



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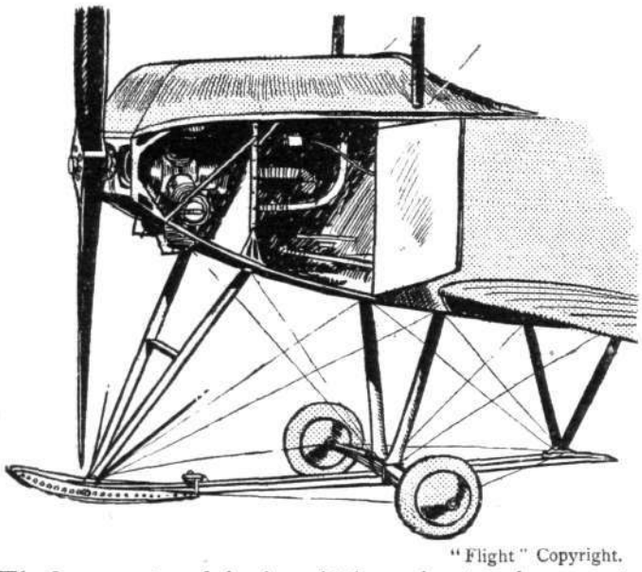
The 50-h.p. Avro tractor biplane.

that they are extremely popular mounts with those pilots who fly them. Back in last October, too, one of these machines was delivered to the Portuguese Republic, it having been bought by public subscription. Perhaps our readers, or at any rate those of them who follow the progress of things fairly closely, will recall that the first machine of this type to leave the Avro works was supplied to



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The front section of the Avro biplane, showing the mounting of the 50-h.p. Gnome motor and the inspection doors.

Mr. J. Duigan as far back as in the September of 1911. It is thus quite an old design, but that is not to say that it is old-fashioned—it is as much up-to-date to-day as any machine we could mention.

The body of the biplane is an ordinary form of built-up box girder covered with fabric to preserve its lines, and to permit of it travelling through the air with as little disturbance as possible. In front, under a metal cowl, is mounted the 50-h.p. Gnome motor, swung between double bearings and turning a 10 ft. Avro propeller at the rate of 1,200 r.p.m. As our sketch shows, inspection doors are fitted in the side of the body so that the motor may be readily accessible when it requires adjustment. The passenger is seated some distance behind the motor, and his seat is so low down in the body that only the upper part of his head projects through the well-padded cockpit well. Thus he is protected to a great extent from the propeller draught. The pilot is equally as comfortably installed in his cockpit behind and what he is not able to see over the side of the machine, he can obtain a sight of by looking through a window let into the floor between his feet.

The landing gear resembles, to a great extent, that originated by Nieuport, used on Nieuport monoplanes. There are a few improvements, however, among them being that the laminated cross-springs are assembled to the wheel hubs in a rather more satisfactory way than is employed on the Nieuport. Mr. A. V. Roe, too, has introduced, on this machine, a clever form of skid toe, which, instead of being rigid, can adapt itself to any shock caused by striking

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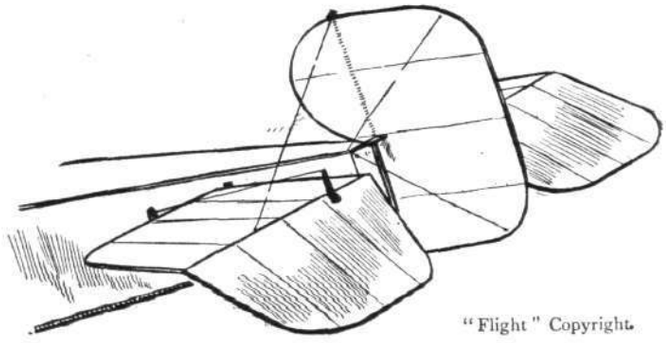
The cleverly sprung skid tip of the Avro biplane.

an obstacle. Its general details can be seen from the sketch we publish.

The planes.—Span 36 ft., and have a chord measurement of 4 ft. 9 ins. Having a high aspect ratio, they are, as may be supposed, very efficient. Their cross-section has a Phillip-type entry, while it has the peculiarity that the under-surface of that part of the



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The tail of the Avro biplane.

section to the rear of the rear-spar is level in normal horizontal flight. Twelve spruce struts separate the planes, and the bracing is entrusted to stranded-steel cable of generous cross section. The planes warp for the correction of lateral balance.

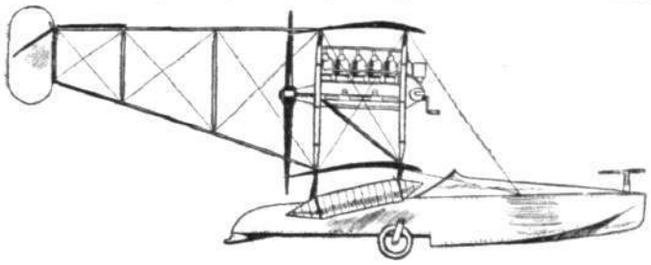
The tail is formed by a flat surface rectangular in plan, at the back of which are hinged two elevator flaps of a total area of 12 square feet. The rudder is novel, in that it is arranged to slide vertically up the rudder bar, against the compression of a coil spring. It is armoured on the underside by a steel shoe, and this is made to serve the double purpose of rudder and tail skid. The average speed of this Avro biplane may be taken as being 65 m.p.h.

SOPWITH AVIATION CO.

Two biplanes, one a hydro-biplane and the other constructed for land work, represent the Sopwith Co. on Stand 22. Both were designed by, and the construction carried out under the supervision of, Mr. T. O. M. Sopwith and his works manager, Mr. F. Segrits, at the Company's works at Kingston-on-Thames. They are no freak machines, these two biplanes of Sopwith's, a rough glance over

them will soon convey to the observer that they are designed by practical men. Of the two, the hydro. is the more interesting since it is the more original.

The 90-h.p. Sopwith Hydro-biplane.—As the silhouette



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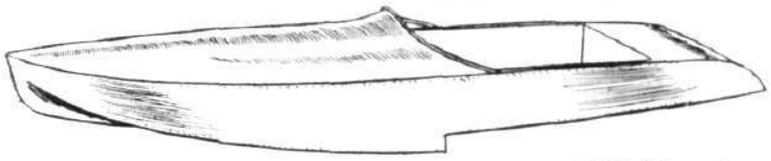
The 90-h.p. Sopwith hydro-biplane.

sketch that accompanies this description shows, it has a biplane unit somewhat of Farman type, mounted on a stepped hydroplane hull.

The hull, constructed by the well-known yacht builders, Messrs. unders, of East Cowes, I.W., is, roughly, 21 ft. in length, and is



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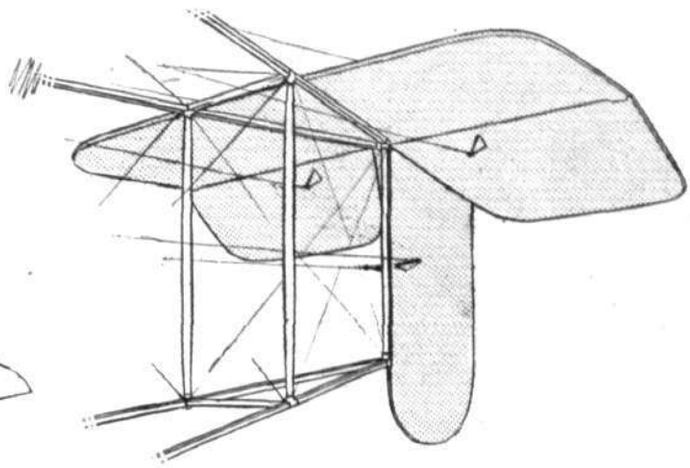
Diagrammatic sketch of the float of the Sopwith hydro-biplane.

sufficiently wide in the beam—4 ft., to be accurate—to seat pilot and passenger side-by-side. Its light framework is covered with two layers of cedar, laced together, and to the skeleton of the hull, by copper wire, a system of construction that Messrs. Saunders have protected by letters patent, and which they employ in building racing motor-craft. Although the hull is of a considerable size, the writer, when he was privileged to see the machine in course of construction, had no difficulty in lifting it; it only weighed 180 lbs. One of our sketches shows the section of the hull in the neighbourhood of the step, which is between 3 ins. and 4 ins. in depth, and which is placed 12 ft. from the stem post. The bottom of the hull being shaped in this manner, the float is rendered all the more seaworthy, for it will not "hammer" to the extent that is noticeable with a flat-bottomed or concave-bottomed hull when "planing" over choppy water.

Supplementary wheeled chassis.—So that the machine may be capable of alighting on land as well as on the water, two wheels are provided, one on either side of the float. They are supported from a common axle member, passing through the hull, by short, hollow struts, beaten and welded up from 14 gauge mild steel. The wheels employed are 24 ins. in diameter, and, apart from the resiliency of the large 4-in. tyres used to shod them, no shock-absorbing devices are fitted. The wheeled chassis may be raised above the level of the bottom of the float, when the machine is being used for overseas work only by rotating the axle which supports it in the manner indicated by one of the sketches.



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The tail of the Sopwith hydro-biplane.

The plane construction. — Both upper and lower planes of the machine are of the same span, 41 ft., and are placed at a slight dihedral angle. They are separated by 12 struts and cross-braced by stranded steel cable in those bays on the same vertical plane

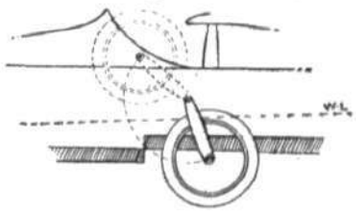

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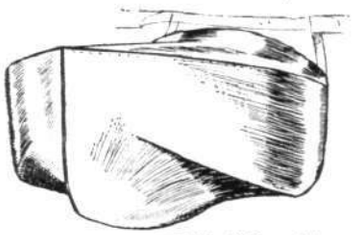
Diagram showing how the landing wheels of the Sopwith hydro-biplane may be drawn up clear of the water.



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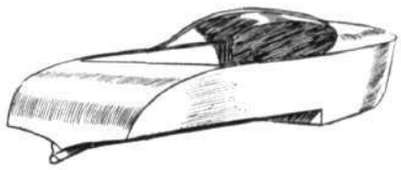
Front view of the Sopwith hydroplane hull.



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Rear view of the Sopwith hydroplane hull.

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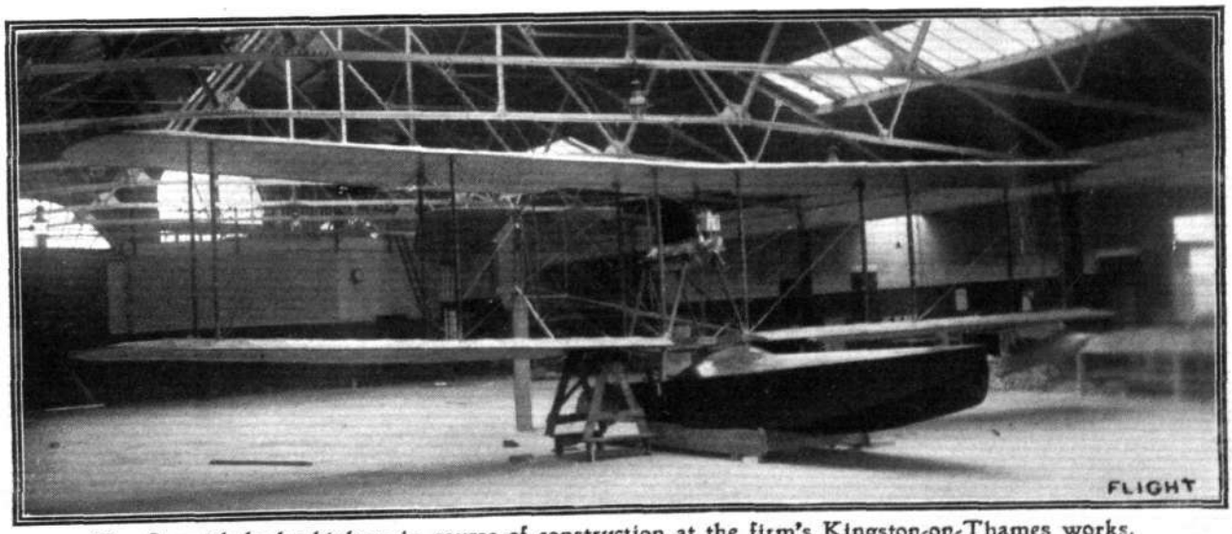
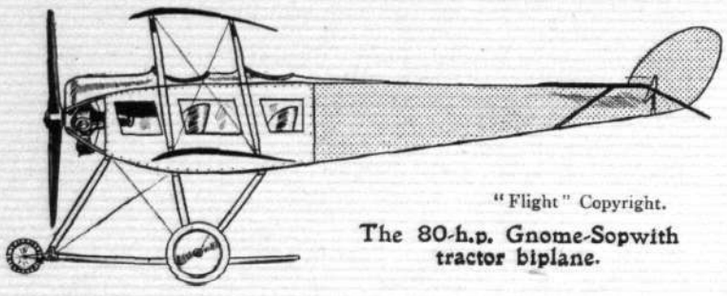
Section of the Sopwith float.



The Sopwith hydro-biplane in course of construction at the firm's Kingston-on-Thames works.

as the main spars, while for front-to-back bracing piano wire is used. The hollow construction of the main spars and of the struts is interesting. The spars are made from a centre portion, I section, cut from ash, to each side of which are bolted plain spruce faces of



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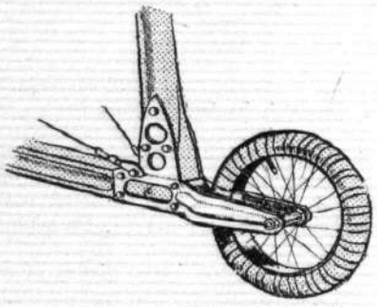
The 80-h.p. Gnome-Sopwith tractor biplane.

rectangular section. This makes a particularly strong yet light spar. The struts are made in a similar fashion, excepting that the central section of ash is of rectangular section to which hollowed out spruce cheeks are applied to give ample cross section and to shape the strut to a good streamline form. Our sketches will make these points clear. The ribs are built up of spruce flanges and cotton-wood webs, a hollow spruce nose strip makes a very satisfactory leading edge, and the trailing edge is kept trim by a piece of steel tubing of streamline section. Cotton-wood, by the way, seems to be an extraordinarily good wood to use for rib construction. It is light, and apparently refuses to split. It is possible to put one end of a Sopwith rib in the vice, and twist the



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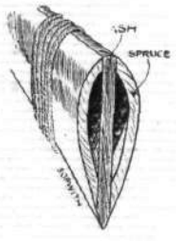
Mounting of the skid tip wheels of the Sopwith tractor biplane.



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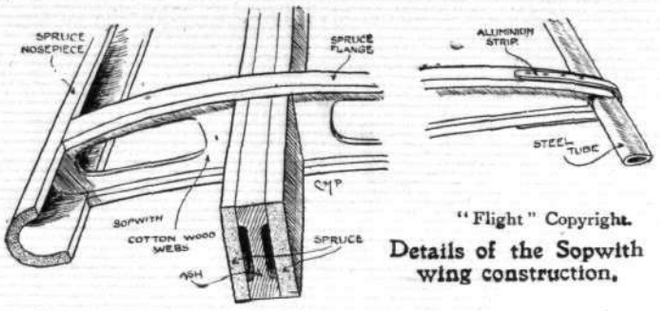
Sketch showing the hollow construction of a Sopwith strut.

other end through 180° without the rib showing any signs of either splitting or of showing a permanent deformation.

The ends of the planes are shaped with steel tubing. It may be as well to remark here that all metal work that is likely to become wet on the machine and so rust, is first heavily enamelled, then bound with glued tape and finally given a good doping over with fabric varnish.

The motor is a 90-h.p. Austro-Daimler, mounted on hickory bearers, and supported sideways between the planes by solid ash struts. These struts are very strongly cross-braced by the heavy gauge steel wire and by steel tubing, so that it would need a shock



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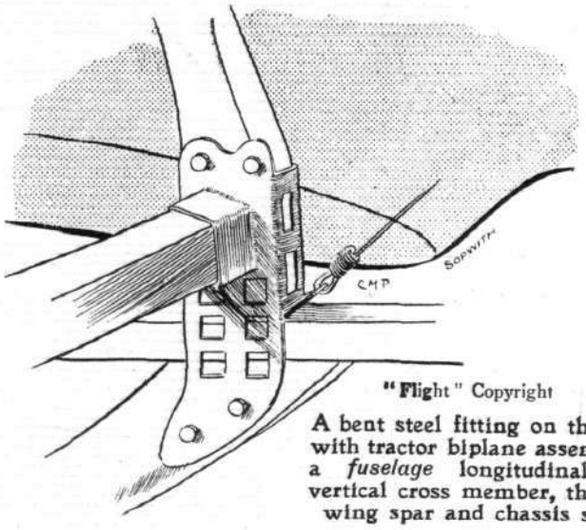
Details of the Sopwith wing construction.

considerably more severe than is generally the lot of an aeroplane to experience, to dislodge it from its position and send it tumbling on the heads of the occupants seated in front of it. The motor drives direct a Levasseur propellor, 8 ft. 6 ins. in diameter.

The tail is a flat surface, 22 sq. ft. in area, and approximately rectangular in plan form. Behind it are hinged two flaps by which



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A bent steel fitting on the Sopwith tractor biplane assembling a *fuselage* longitudinal, the vertical cross member, the rear wing spar and chassis strut.

the elevation of the machine is controlled. It is supported by two spruce outriggers which meet at the rudder bar. The skeletons of all the tail organs are constructed of bent steel tube, with ribs of the same material, oxy-acetylene welded in position. There is a front elevator fitted above the nose of the float. Its area is equal to that of the two rear elevating flaps, that is 15½ sq. ft.

Dual control is fitted and is in the form of a wide swinging bridge

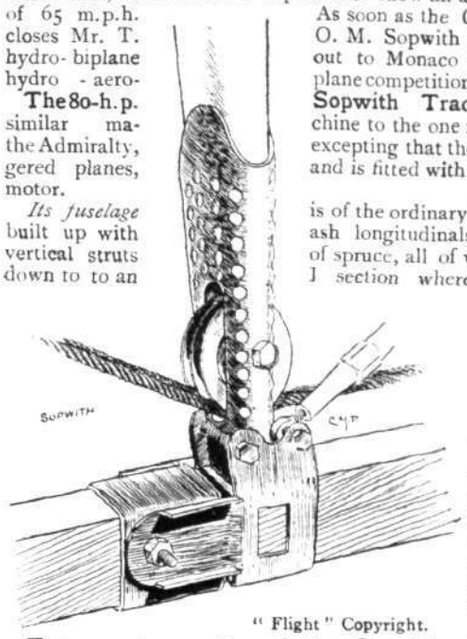
The 80-h.p. Sopwith tractor biplane.

on which are mounted two vertical wheels, Deperdussin fashion for warping. Ruddering is done by the conventional form of foot bar.

Weighing 1,200 lbs. light, and designed to carry 450 lbs. of useful load, the machine is expected to show an average flight speed of 65 m.p.h. As soon as the Olympia exhibition closes Mr. T. O. M. Sopwith intends taking the hydro-biplane out to Monaco to compete in the hydro-aeroplane competition there in April next.

The 80-h.p. Sopwith Tractor Biplane—a similar machine to the one recently supplied to the Admiralty, excepting that the machine has staggered planes, and is fitted with an 80-h.p. Gnome motor.

Its fuselage is of the ordinary lattice girder type, built up with ash longitudinals, and cross and vertical struts of spruce, all of which are spindled I section wherever possible for down to to an lightness sake. The sockets, by which they are assembled, are cut from mild steel, and shaped so that they wrap the longitudinal members, a method by which drilling of the spars and consequently weakening them, is avoided.



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The warping pulley of the Sopwith tractor biplane, showing how the same fitting is combined with the rear spar hinge.

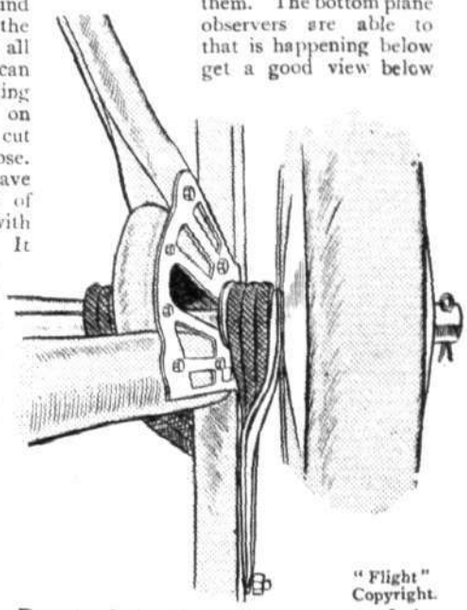
The motor, a 80-h.p. Gnome, is mounted in front by bearers on either side of the crank-case. It is direct coupled to a Levasseur propeller, 8 ft. 6 ins. in diameter. A metal cowl covers the top half of the engine, so preventing any oil or exhaust fumes reaching the people on board.

The planes are almost identical with those of the hydro-biplane we have just described, excepting that in the tractor biplane the top plane is staggered 1 ft. in advance of the lower one. Similar built-up spars and struts are used in both machines. For facility of transport the planes can quickly be dismantled in two sections. The end section of the rear span on either side of the machine is hinged to the rigid central section so that the warping may be operated without any internal strain occurring in the wing construction.

The landing chassis is of the combined wheel and skid type. The body of the machine is supported from two long hickory skids by six spruce struts. The two pairs of rear struts are assembled to the skid by a welded steel fitting which is also slotted to take the axle of the two landing wheels. The latter are strapped with rubber cord to the skids. Miniature skid-tip wheels are fitted. They are 13 ins. in diameter, and are each supported by a pair of beaten steel fittings. The main skids, the sides of which are hollowed out for lightness, are continued back 3 ft. or so behind the rear chassis struts, in such a manner that there is no necessity to provide a rear tail skid. These continuations of the rear skid have the advantage that they act as most efficient land brakes when it is required to pull the machine up quickly on landing.

The tail is semi-circular in shape and has a radius of 5 ft. As in the hydro-biplane, the skeletons of all the tail organs are constructed from steel tubing.

The machine is arranged to seat three, two observers side by side at the centre of gravity of the machine, and the pilot some little distance behind them. The bottom plane being staggered back, the observers are able to obtain a good view of all that is happening below them. The pilot can get a good view below him, too, for the trailing edges of the planes on either side of him are cut away for that purpose.



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Details of the chassis suspension of the Sopwith biplane as seen from above.

The Sopwith works have a very neat method of forming an eye with *stranded steel cable*. It is not an entirely original method, as the writer has noticed it on a number of other machines, especially in France. However, since it has not yet been described in these pages, it may be as well to mention it now. The cable is well cleaned, and on it is threaded a flattened tube of very soft copper. Then the cable is turned back, forming a loop, and in the loop is placed an eye. The copper tube is then slipped up, over the loose cable end until it is tight against the eye. It is then twisted several times, and finally the whole job is sweated up together.

Petrol is carried on this machine, in a tank under the passenger's seat. From there it is fed under pressure to a service tank arranged below the motor cowl. Weighing 1,100 lbs. light, this Sopwith biplane, has been designed to carry a useful load of 450 lbs. at a speed of from 65 to 70 miles per hour.

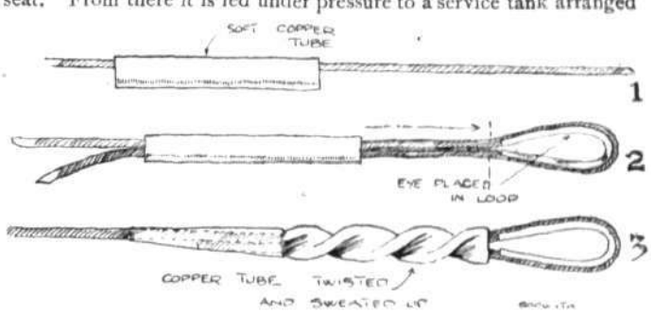

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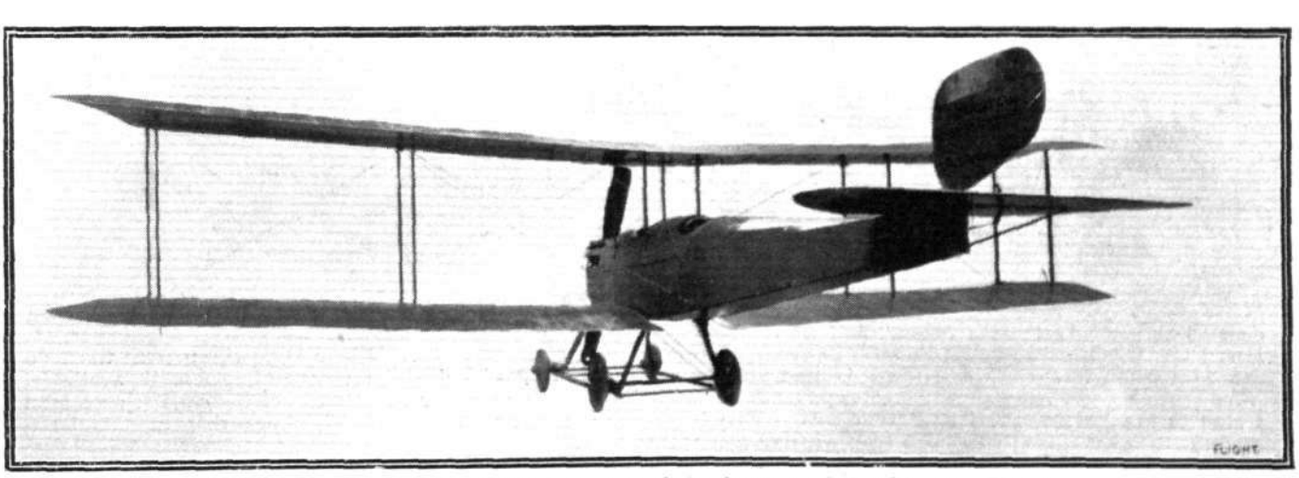
Diagram illustrating how stranded cable terminals are made on the Sopwith biplane.



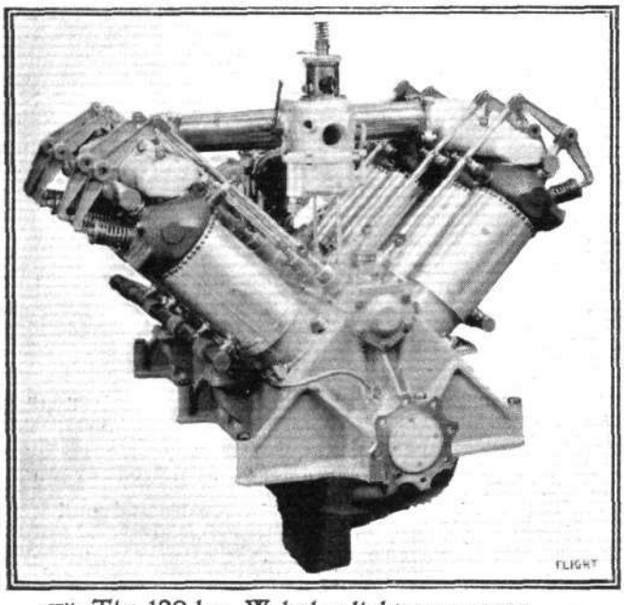
The new 70-h.p. Bristol biplane, one of the features of the Olympia Show.

AERO ENGINES AT OLYMPIA SHOW.

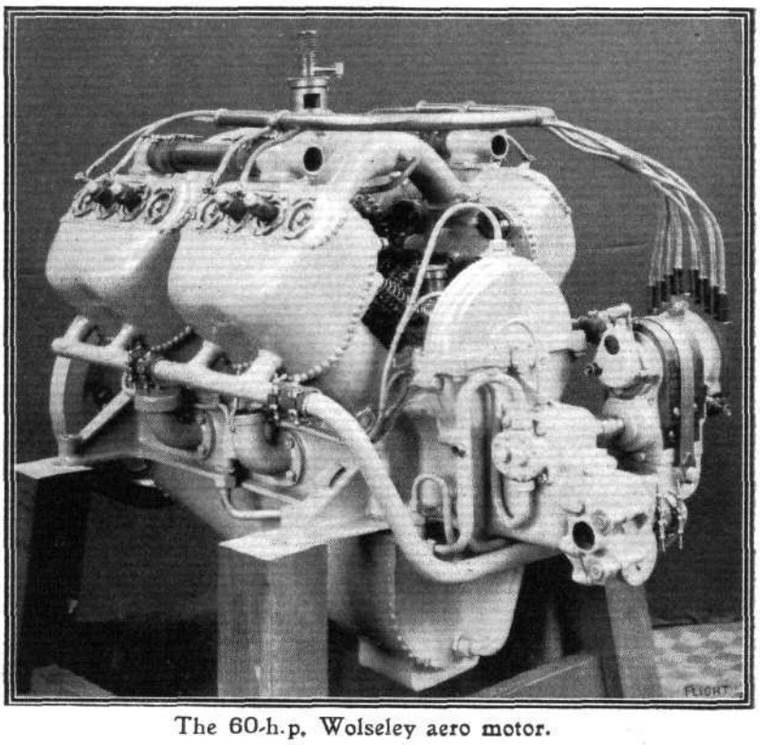
WITHOUT question, the engines at Olympia will hold the attention of those seriously interested in the movement as much, if not more than the aeroplanes themselves. We have said elsewhere, and it is a point to be borne very much in mind, that the real need of the country is a thoroughly satisfactory British-built aero engine.

In this respect we trust that the present exhibit may be truly notable, and that it may be the beginning of an era of great prosperity for the British aero engine constructor. The fact remains that he has not hitherto held the market, but we believe that the market is tending in a direction that will make the qualities in which the British engine builder is most likely to excel more acceptable to the prospective purchaser in the form in which they are likely to be provided.

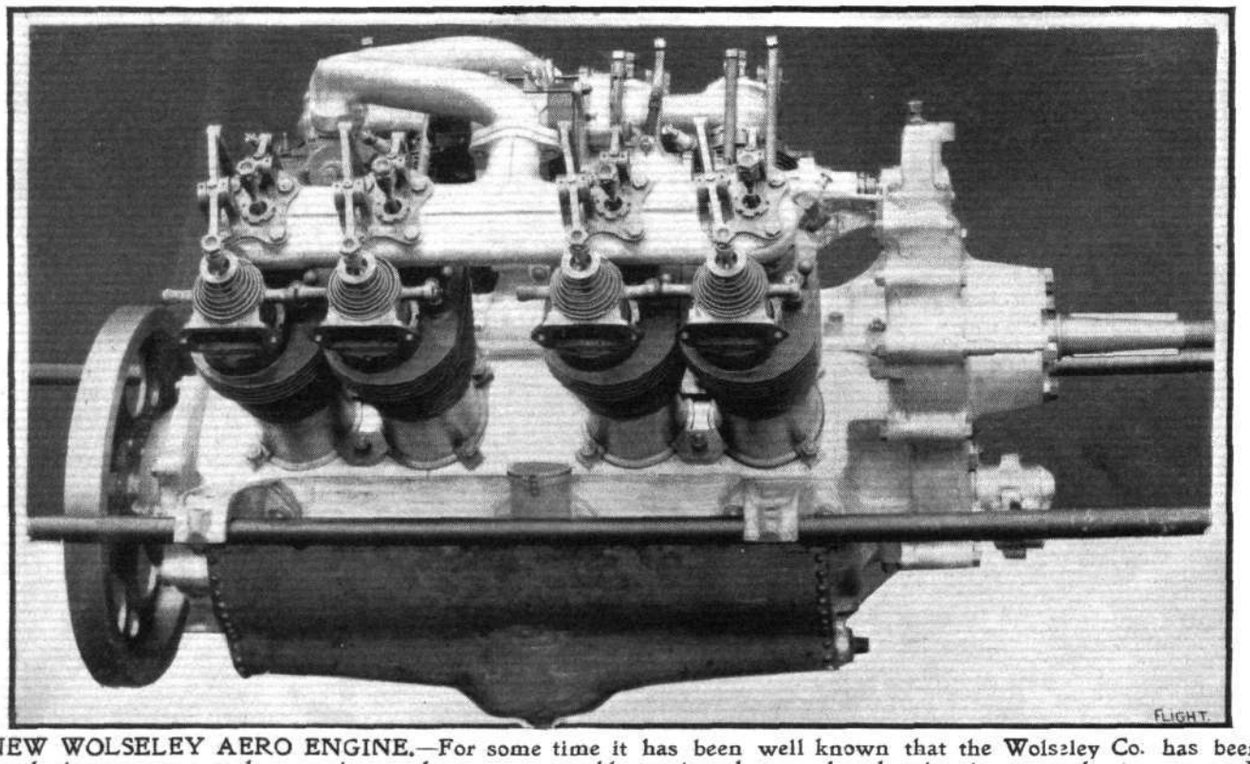
Be that as it may, it is beyond all question that British engines must be available for British machines, and it is equally apparent



The 120-h.p. Wolseley light aero motor.

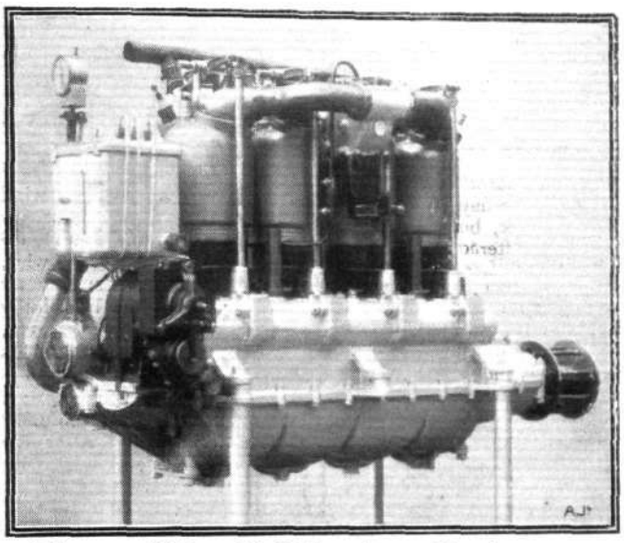


The 60-h.p. Wolseley aero motor.



NEW WOLSELEY AERO ENGINE.—For some time it has been well known that the Wolseley Co. has been developing a new aeroplane engine, and we are now able to give photographs showing its general appearance. It is rated at 60-80-h.p. and is, as will be seen, of the V type of construction. There is, at the present time, no more important matter in aviation than that an adequate supply of good British-built engines should be available. The Wolseley Co. have already had experience in the building of aero motors, and some of the earliest successful flying in the Voisin school in France was accomplished with a Wolseley motor. We hope that in this latest attempt they may have succeeded in producing a machine capable of satisfying the somewhat severe requirements of flying, for it will mean much to have the Wolseley Co. thus permanently established in the industry devoted to aeroplane engine construction.

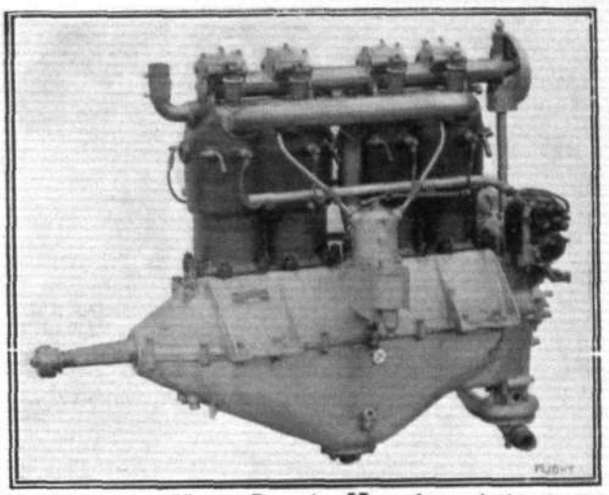
that they must be in every respect up to the required standard. In England this means that the builder has to do all his own experimental developments at his own expense, for he will receive no particular encouragement from numerous trial orders. It is this more than anything else that has delayed progress in British manufacture, but it is a situation that has to be faced, and there is small use wasting breath trying to change a policy that is only too obviously permanent. The authorities need British engines, but they are not in a position to buy anything that does not come up



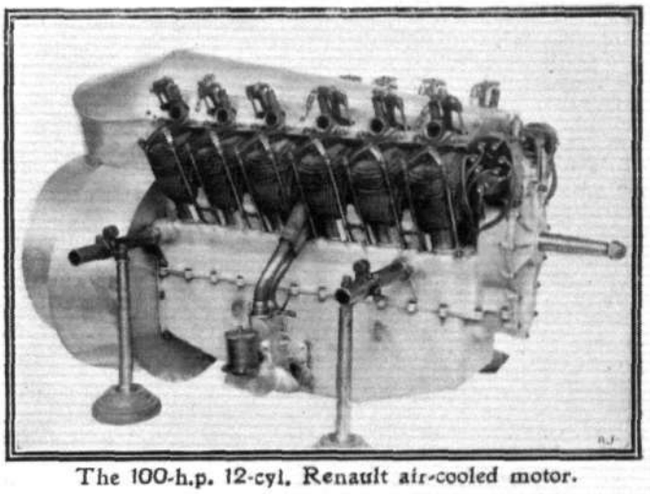
The new 1913 model 65-h.p. Austro-Daimler motor.

to the standard of their requirements, and so it entirely rests with the British constructor to rope the market into his own field.

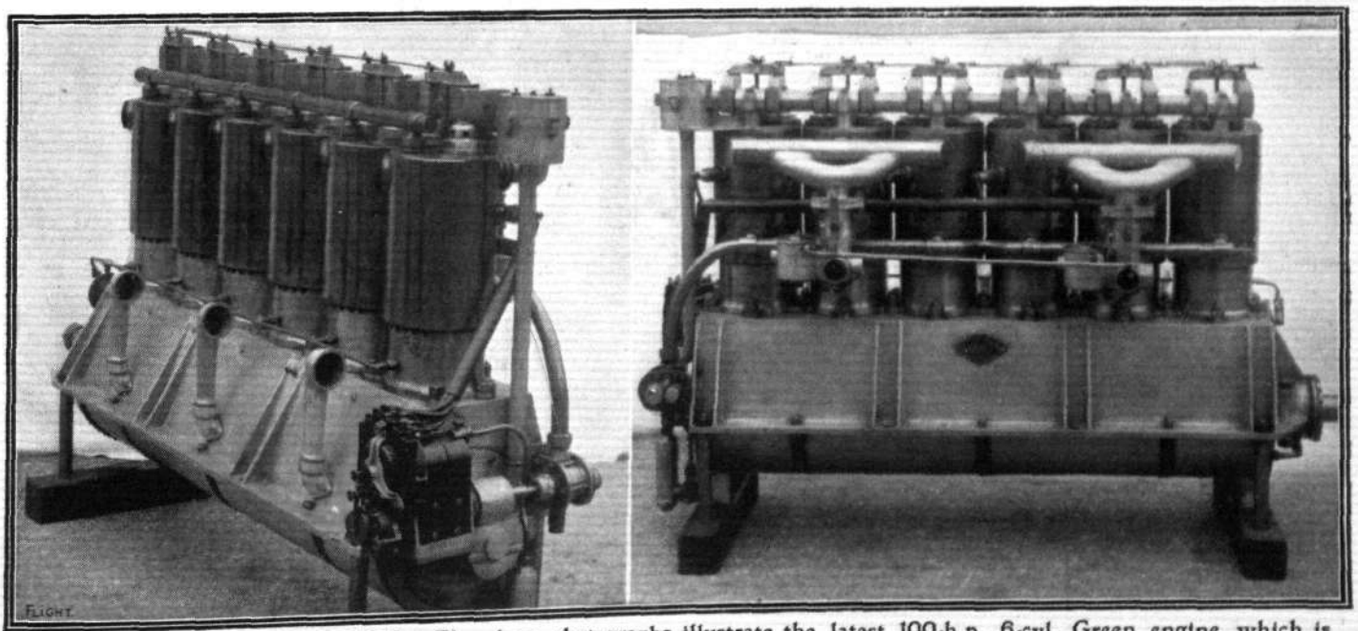
Visitors to Olympia will be able to inspect a fine collection of engines of various types, with the British industry well represented in the Wolseley, Green and N.E.C. From France there will be the Anzani, Gnome, Clerget, Salmson and Renault; from Germany, the Mercedes, Benz and N.A.G., and from Austria, the Austro-Daimler.



The 85-95-h.p. Milnes-Daimler-Mercedes aviation motor.



The 100-h.p. 12-cyl. Renault air-cooled motor.



THE 100-H.P. GREEN ENGINE.—The above photographs illustrate the latest 100-h.p. 6-cyl. Green engine, which is of British design and construction throughout. The Green Engine Co. are a pioneer concern in aero motors, and they have likewise been the most successful of makers in this country. In the British Military Trials, the 60 h.p. Green made a remarkable performance for fuel consumption and oil consumption on the Avro biplane, and it must be borne in mind that economy under these heads is a matter of importance in long-distance flying. The 60-h.p. engine was somewhat less powerful than was required for a machine designed to pass the military tests, but at that time the 100-h.p. model was not finished. With its 6 cyls. and correspondingly improved evenness of turning moment, this later model should remove much of the mistrust that it is apparent pilots feel towards 4-cyl. vertical engines as a type. In an aeroplane, it must be remembered, the foundations are themselves air-borne, and the absence of vibration is thus of the very greatest importance.

FROM THE BRITISH FLYING GROUNDS.

Brooklands Aerodrome.

FRIDAY, last week, at 7.20 a.m., Mr. Sopwith (carrying Mr. Hawker as a passenger) made a most successful trial flight on his new tractor biplane, which is fitted with an 80-h.p. Gnome engine, reaching a speed of over 65 miles an hour, the machine proving a fast climber, as it demonstrated its ability to climb at the rate of 500 ft. a minute. The machine has been dismantled, but it will be at the Show.

Mr. Hawker, on Saturday, was on the Burgess-Wright biplane, but owing to the strong wind did not stay out long. During the latter part of the afternoon the wind dropped, and some excellent flights were made. Messrs. Barnwell and Knight made some fine cross-country flights at an altitude of over 2,000 ft. Mr. Spencer was on the Spencer biplane, and also with pupil and passengers. Messrs. Merriam and Bendall were out on the Bristol biplanes, flying solo and with pupils. Mr. Raynham finished up his afternoon's work on the Coventry Ordnance biplane, with a fine *vol plané* with engine shut off from a height of 1,500 ft., coming down right in front of his shed.

Owing to the wind and rain, Sunday, no flying was possible until the afternoon, when a Quick-Starting and Alighting Competition was held, won by Mr. Raynham, who accomplished a magnificent performance on the Coventry Ordnance biplane, for, although by the terms of the competition it was only necessary for him to shut off his engine at 100 ft., he elected to do so at 1,000 ft., and effected a very clever landing within only a few feet of the mark. Good performances were accomplished by Mr. Merriam (second) on a Bristol biplane, and Mr. Hawker (third) on the Sopwith biplane. Mr. Bendall also competed. Whilst making high circuits both Mr. Raynham and Mr. Hawker disappeared from sight in the clouds.

It is rumoured that Mr. Eric Loder contemplates qualifying as an aviator, and that he will have the advantage of personal tuition by Mr. Merriam, the Bristol expert.

Mr. Bendall's recent "bag" of a brace of partridges whilst flying the Bristol biplane at Brooklands seems to have been responsible for all sorts of misleading statements concerning the incident in question, for no damage whatsoever was done to his propeller.

There is every promise that the annual dinner of the Brooklands Aero Club, which is fixed for Friday, the 21st inst., and at which Mr. T. O. M. Sopwith will preside, will be the most representative re-union of all those interested in aviation in this country which has yet taken place, for all the most famous pilots are expected to attend, as well as a large number of members of the Royal Flying Corps and others, who will thus have a unique opportunity of meeting and exchanging views with their instructors.

Bomb-Dropping Competition, Sunday, February 16th. Entrants: Messrs. Merriam and Bendall (Bristol biplane), Spencer (Spencer biplane), Barnwell and Knight (Vickers Farman biplane), Hawker (Sopwith biplane), Raynham (Coventry Ordnance biplane), Sopwith (Sopwith biplane)

Bristol School.—Wind blowing a gale all day Monday, last week, all pupils busily occupied in the hangars. On Tuesday, late in the afternoon, Merriam went up for a test, but still found weather too bad for pupils. He was out early on Wednesday, flying round to wake pupils. Lieut. Crawford Kehrmann was out later for some really clever circuits, followed by Mr. Lane. Lieut. Blatherwick was out for a couple of good straights, Bendall making a solo. Merriam tested after breakfast, and again in the afternoon, but found weather too bad for pupils.

On Thursday, Merriam was first up, Bendall up on another machine. Lieut. Crawford Kehrmann was out for several good circuits and half right-hand turns, later describing two excellent figures of eight. Mr. Lane was also putting up a good show, making four good figures of eight and a number of landings. Merriam took Lieut. Blatherwick for an instructional flight. Wind was too bad after breakfast. Bendall early made test on Friday, with Lieut. Crawford Kehrmann, this pupil then going out for a good flight with figures of eight at 400 ft. Mr. Lane following with another excellent trip in spite of the strong wind. Both of these pupils were out for further solos later, but wind and rain stopped further work. Rain and wind after breakfast rendered flying impossible.

On Saturday, wind abated a little, and Merriam was up for a test, taking Lieut. Blatherwick as passenger, but conditions were found unfavourable for pupils. Merriam gave an exhibition flight in a fairly strong wind, afterwards taking Mr. Archer as passenger. Bendall on another machine with Mr. Lane. Merriam was later out for a test, and then sent Mr. Archer for the first part of his certificate, which he accomplished in fine style.

Very windy up to well into the afternoon on Sunday. Merriam made several tests, but found conditions very bumpy. Lieut. Crawford Kehrmann made a couple of good straights, later Merriam and Bendall were out for getting-off and landing competitions, Merriam winning second place.

Vickers School.—Tuesday afternoon, last week, Barnwell doing circuits on No. 5 mono. in a high wind. Next day, in the morning, Major Cameron did several good straights on No. 3 monoplane, showing good progress. Afterwards Barnwell testing No. 3 with speed indicator. In the afternoon Barnwell was doing circuits on No. 5 monoplane at 2,000 ft., afterwards giving place to Knight. On Thursday, after test flights by Knight, Major Cameron did some straights on No. 3 mono., making a heavy landing, buckling wheel and breaking skid and propeller.

Barnwell was testing new engine on No. 5, Saturday morning. In the afternoon Barnwell and Knight out on No. 5.

Eastbourne Aerodrome.

ON Wednesday, last week, there was rather too much wind for school work, but Fowler managed to give some passenger flights in the afternoon. Thursday was much the same with regard to weather, and Lieut. Minchin was again disappointed, as Fowler, after making a test flight, decided the conditions were not sufficiently favourable for him to go for his *brevet*. Saturday was beautifully fine, but a fairly strong breeze prevailed till late in the afternoon. No school work was done, but at about 4 p.m. Fowler had his Blériot out and went for a trip to Bexhill and back. Sunday was rather rough and foggy, but Monday turned out a perfect day. Fowler started the morning with a test flight on the Blériot, during which his engine petered out through a choked jet. After the defect had been remedied, Lieut. Minchin went up and flying with great regularity successfully completed the necessary tests for his *brevet*. Later on in the morning, Messrs. Fowler and Hucks went for a joy ride on the Bristol. In the afternoon Fowler gave an exhibition flight on the Sommer, and afterwards sent up Mr. Thompson for his *brevet*, which he got through in good style, landing right on the mark at the conclusion of his second half. Lieut. Lerwill then went up on the Bristol, followed very shortly by Mr. Fowler on the Sommer, both machines being in the air at the same time, the Sommer proving itself somewhat the faster of the two. Mr. Roberts was also out on the Bristol, with Fowler up behind, and Mr. Ellis, one of the R.A.C. observers, had a passenger trip, which he appeared to enjoy immensely. Tuesday was another good day, and a lot of useful practice was put in. Mr. Morkill, a new pupil, received two instruction flights. Gassler on the 35-h.p. Blériot and Fowler on the Sommer gave exhibition flights, and Roberts was out on the Bristol now flying quite well and should soon be fit to go for his ticket.

London Aerodrome, Collindale Avenue, Hendon.

Grahame-White School.—Owing to the strong wind no pupils turned up Monday, last week.

A new pupil joined, Mr. J. G. W. Gamson, next day, but it was far too windy for school work.

On Thursday, Lieut. P. Small doing straights on No. 7 machine nearly all the morning under supervision of Mr. Manton. Desoutter doing fine circuits on No. 6 monoplane. Mr. Lan-Davis rolling on 2B with Mr. Cheeseman. Mr. Bayetto rolling well on 4B monoplane under supervision of Mr. Cheeseman and all other pupils getting in good practice in turn.

Mr. Birchenough, a new pupil, joined school Friday, but too windy for much school work.

Blackburn School.—Tuesday, last week, in the afternoon, Mr. H. Blackburn did a test flight on the No. 2 machine, and on Wednesday, after test flight by Mr. Blackburn, Dr. Christie practised straight flights for 30 mins. On Saturday Mr. H. Blackburn made an exhibition flight of about 15 mins.

Blériot School.—The first three days of last week were too windy for school work, but on Thursday, MM. Teulade and Gandillon were out doing very well on No. 3, and Mr. Williams did rolling practice on LB 1. The following day was windy, but Teulade managed to do a straight flight on No. 3 before the wind became too strong for further work.

British Deperdussin School.—On Tuesday, last week, Mr. Spratt doing a couple of circuits on No. 4 'bus to try the wind, but found it too strong for pupils. School work impossible for the rest of the week owing to high winds. On Monday, Lieut. Hordern got in some good practice on No. 3 'bus, doing straights. This pupil is making very good progress, and should soon be ready for No. 4. Mr. Phelps out on same machine, getting some good ground work.

W. H. Ewen School.—The early part of last week was practically a blank for pupils getting in any flying practice. On Wednesday, Mr. Lewis W. F. Turner was doing some fine exhibition flying in a stiff wind.

Thursday turned out a favourable day, and the pupils were out at

7.45 a.m. After a test flight on the 35-h.p. Caudron by Mr. Lewis Turner, Lieut. M. W. Noel made several good flights on the same machine. Under the instruction of M. Baumann, Messrs. Torr and Stewart were making excellent progress in straights on No. 2 monoplane.

On Friday, the pupils were out at 7.45 a.m., and some capital practice was put in. Lieut. M. W. Noel made several nice circuit flights at 300 ft., and showed that he was ready for his *brevet* tests. Mr. Lewis W. F. Turner out doing some exhibition flying on the little Caudron.

Although there was a slight breeze blowing, the weather on Saturday afternoon was very good. The proprietors of the London Aerodrome having been kind enough to give their permission the usual flying exhibitions were interrupted for a short spell and Lieut. Noel went out on the 35-h.p. Caudron for his *brevet* tests. Flying at a height of 200 ft. he made a brilliant flight and easily passed the first half of the tests. Later on he again went up on the little Caudron, and flying in the same confident manner at a height of 300 ft., he succeeded in completing his flights for the R.A.C. certificate.

Mr. Lewis W. F. Turner was out doing several fine exhibition and passenger flights on the 35-h.p. and 60-h.p. Caudron biplanes.

There was no school work on Sunday, but M. Baumann was out flying the 35-h.p. Caudron.

Temple School.—Mr. Temple was out on Wednesday, last week, on the 35-h.p. school Caudron biplane, and flew at intervals during the day. On Thursday, he gave two exhibition flights on the Caudron in a 25-mile-an-hour wind, following up on Saturday with an exhibition in the afternoon, making four flights. On Monday, Mr. S. L. Temple passed his certificate tests in good style, flying at an average height of 200 ft., and making both landings dead on the mark. He completed the whole test during the day, and later made a short flight in the evening on the 35-h.p. Candron.

Salisbury Plain.

Bristol School.—Blowing a gale all day Monday, last week, and all work had to be confined to the hangars.

On Tuesday the gale of the previous day had not abated in the morning, and flying was, therefore, not attempted. It was still very windy in the afternoon, but England was out on a newly-erected 80-h.p. monoplane, and flew for 20 minutes in a wind of fully 35 to 40 miles per hour.

Instruction was carried on all day Wednesday in the hangars, owing to the boisterous state of the weather. England out later in the afternoon, reaching 3,500 ft., but this was the only flight made.

On Thursday, England tested quite early, after which Lieut. Vaughan made an excellent flight in a strong wind, showing himself to have perfect control of the machine, and landing well. England gave tuition to Major Merrick on a biplane, reaching a good height, and finishing with a *vol plané*, Jullerot took Major Merrick on an 80-h.p. monoplane, and whilst up thick fog covered the Plain, but they fortunately made a good landing. Fog prevented further work.

The wind was blowing a gale all day Friday, and work was briskly carried on in the hangars.

On Saturday wind was still very high. Harrison was out for a solo of ten minutes, whilst England took Mr. Tod for tuition in a side-by-side, and Harrison took Capt. Landon in a biplane. Jullerot was out for a solo of ten minutes in a 50-h.p. monoplane, Pixton taking Major Merrick in a biplane. England finished up with a solo on a 50-h.p. tandem monoplane.

Royal Flying Corps.—Tuesday of last week saw no flying owing to rain, but on Wednesday there was a change, of which the R.F.C. took full advantage. Major Brooke-Popham was out on BE biplane 205 for a 15-minutes flight, followed by Major Higgins, D.S.O., with Air Mechanics Aylers and Robins on biplane 203, while Lieut. Cholmondeley with Serjt. Bruce on

Photo by Gale and Polden, Ltd., Aldershot.

STAFF OFFICERS AT THE CENTRAL FLYING SCHOOL, UPAVON.—Reading from left to right, front row: Capt. Fulton, R.F.A.; Lieut. Longmore, R.N.; Capt. Salmond; Major Gerrard, R.M.L.I.; back row: Capt. Lithgow, R.A.M.C.; Assistant-Paymaster Lidderdale; Major Trenchard; Capt. Paine, M.V.O., R.N., Commandant; Lieut. and Quartermaster Kirby, V.C.; Eng.-Lieut. Randall.

Maurice Farman 214 flew to Winchester and back at a height of 3,000 ft. In the afternoon Lieut. Cholmondeley with Pilot Strugnell went on Maurice Farman 214 to Central Flying School and back.

Major Higgins was out on biplane 203 on Thursday, flying in a 40-mile wind, but on Friday there was no out-door work. On Saturday, Lieut. Carmichael and Lieut. Cholmondeley put in some scouting practice on the Maurice Farman, and Major Brooke-Popham on BE biplane 205, went to a height of 2,000 ft. Major Higgins on biplane 203, made a 22-minutes flight, and later, with Air Mechanic Geard, was up for 1 hour 10 minutes around Andover, Southampton and Salisbury, at a height of 3,300 ft. When at Southampton he discovered he had no map, but knowing the district he arrived back without any trouble. In a subsequent trip with Mechanic B. Cox he was flying around Shrewton.

Monday was ideal for outdoor work, and the R.F.C. put in a full day, each officer making several good flights. Major Brooke-Popham on BE biplane 205, after several trials, finally started for Farnborough, making the trip in the good time of 32 mins., his greatest altitude being 4,800 ft. He is now away on leave, and Major Higgin, D.S.O., has taken over command. This officer was out on biplane 203, with Lieut. Carmichael as passenger, and went over to the C.F.S. at Upavon and back. Lieut. Cholmondeley made several good flights during the day, taking up several air mechanics as passengers on Maurice Farman biplane 214, one trip being to the new sheds at Mill Ball, Netheravon. Lieut. Carmichael also made several scouting trials around the Plains. Fog prevented outdoor work on Tuesday.

Shoreham Aerodrome.

Avro School.—On Saturday, last week, the only day on which flying has been possible, Simms was testing new stick on E.N.V., also good flight on Green-engined machine in gusty wind. In afternoon Batty-Smith skimming on school machine. Rising wind stopped further work.

Monday, perfect weather, Batty-Smith doing very good straights but landing down wind, capsized in a ditch, breaking propeller and *fuselage*. Machine, however, will be out again this week. Powell flew to rescue with two mechanics on 60 E.N.V. on which Wynne-Roberts rolled later. Then Simms up on E.N.V. for 15 mins. circuits; after tea, cross-country at 2,000 ft. for 35 mins. round Worthing, after which he took a passenger two circuits. Tuesday, Simms and Powell "waking up England." Simms to Brighton and round Palace Pier; Powell dodged lamp-posts on Worthing Pier for about 15 mins. After lunch Simms up for 45 mins., visiting Brighton again, then Worthing and so home. He then filled up with petrol and a passenger, who had his first cross-country trip round Lancing. Powell flew to Storrington *via* Worthing, stunted round the ancestral chimney pots and returned home about an hour later at 5,000 ft. After tea Simms made a short flight over the Downs round Lancing college, after which, Powell again went up, flying till dusk; lost in a thick ground mist, he scraped the top of a hay stack with the skid and returned, litterally "bearing his sheaves" with him, but landed safely in the aerodrome. A good day's work for the E.N.V.

Upavon (Central Flying School).

Royal Flying Corps.—On Tuesday last week the wind was too strong for flying, blowing strongly from the south-west. Next day it was a little better, but was still rather bumpy. On Avro 404 Capt. Fulton, R.F.A., was giving instruction to Lieut. Read for half-an-hour. On the same machine Air Mechanic Higginbottom made a good flight of 15 mins. with Lieut. Littleton as a passenger. A good morning's work was got through by Air Mechanic Higginbottom, who, besides the above flight was giving instruction to Leading Seaman Marchant and Sergt. Goodchild on Avro 406. Capt. Fulton was on practice ground for 20 mins. with Lieut. Holt. Lieut. Holt was then flying straights for 10 mins., and then made one circuit of the aerodrome, doing rather well for first time alone on such a fast machine. Capt. Fulton made one flight on Avro 406 with Capt. Mellor as passenger. On Maurice Farman 411 Lieut. Longmore, R.N., with Capt. Salmond as passenger, made three flights of 18, 13, and 15 minutes respectively, Lieut. Cholmondeley arrived from Lark Hill on Maurice Farman 214 with Air Mechanic Strugnell as passenger returning almost immediately. Lieuts. Boyle, Marix, Harvey and Warter all made good flights of 6 to 14 minutes each on Maurice Farman 418. Capt. Millar made a 6-minute flight on the same machine. On Maurice Farman 425 he later made a good flight of a quarter of an hour. Lieut. Conran made one circuit of the aerodrome on same machine. On Henry Farman 420 Major Gerrard made a 9-minute flight, and later with Sergt. Vagg under instruction for 12 minutes. On the Short biplane 401 Lieuts. Roupell, Bowhill, and Unwin, made good flights of 7 to 14 mins. each. Sergt. Vagg received 22 mins instruction from Major Gerrard on same machine. Lieuts. Soames and Burroughs, on BE 416, both made flights of a quarter of an hour. Capt. Salmond, with Sergt. Mead as passenger, for 10 mins. On the same machine Lieut. Arthur made an excellent flight of 20 mins., reaching 2,500 ft. On BE 417, Capt. Salmond made one circuit of aerodrome, and then took Capt. McDonnell for 32 mins, and Lieut. Dawes for 12 mins.

On Thursday there was a heavy mist early in the morning, which was blown away on the wind freshening. Capt. Fulton was giving instruction to Air Mechanic Harrison for half an hour on Avro 404. Air Mechanic Higginbottom took Sergt. Goodchild for 15 mins. on Avro 406. On Maurice Farman 418 Lieut. Marix was flying for half an hour, and Lieut. Harvey made a short flight of 4 mins. Lieut. Boyle and Capt. Millar both made short flights on Maurice Farman 425. Capt. Salmond for half-an-hour with Sergt. Mead on practice ground on BE 416. Lieut. Arthur then took over machine and started at 10.55 a.m. for a cross-country flight. Finding the wind too rough, he landed, and wind turned machine over, doing slight damage to top plane. On BE 417 Lieut. Soames was flying for 14 mins. In the afternoon the wind was too strong for any machines to venture out.

On Friday it was blowing a gale all day, and no flying was possible.

On Saturday no machines were out. Major Ashmore flew a Maurice Farman 428 from Farnborough in very strong wind. On Maurice Farman 214 Lieut. Cholmondeley arrived from Lark Hill, returning later.

On Monday the weather was ideal for flying, a slight wind blowing from the south. On Avro 406, Air Mechanic Higginbottom giving instruction to Leading Seaman Marchant. Captain Fulton, R.F.A., with Lieut. Rathbone on same machine for half an hour, and Lieut. Read for 10 mins. On Avro 404, Lieut. Holt made two good circuits of 10 mins. each. Captain Fulton was giving instruction to Lieut. Marks for a quarter of an hour, Lieut. Marks then doing straights for 13 mins., and later two circuits. Lieut. Small made two circuits in excellent style, and made good landings. Air Mechanic Higginbottom flew one circuit with Lieut. Warter as passenger. Lieuts. Read, Littleton, and Warter were all receiving instruction from Capt. Fulton, each being in the air about a quarter of an hour. Capt. Mellor also in the passenger seat for 15 mins. On Maurice Farman 403, three *brevets* were successfully taken, Capt. Salmond, Lieut. Ross, and Lieut. Kennedy all flying for them in good style, Lieut. Kennedy also made a good flight of a quarter of an hour on Maurice Farman 418. Lieut. Longmore was giving instruction to Sergts. Stafford and Street for 45 minutes, and to Air Mechanic McNamara for 7 minutes. Colonel Cook was in the passenger seat of Maurice Farman 411, with Lieutenant Longmore as pilot. On Maurice Farman 425, Lieut. Boyle made four good flights, totalling ¾ hr. Capt. Salmond, R.F.A., made an excellent flight of 50 mins. Lieuts. Marix, Harvey and Conran were all out for solos. Capt. Millar made two good flights of 18 mins. and 7 mins. On Maurice Farman 403, Sergt. Stafford, in machine for first time alone, made a good flight of 20 mins. Lieuts. Ross, Kennedy, and Capt. Salmond were all making flights of 15 to 45 mins. On BE 417, Capt. Salmond was passenger carrying—Lieut. Vernon 22 mins., Lieut. Bigsworth 40 mins., and Lieut. Gibson for 45 mins. Lieut. Gibson was rolling for 3 mins. on practice ground. Lieut. Arthur made a good flight of a quarter of an hour. On Short biplane 401, Major Gerrard giving instruction to Sergts. Spencer, Wright, and Vagg. Lieut. Roupell flew one solo of 10 mins., and Lieut. Oliver two solos of 5 and 9 mins. Leading Seaman Ashton under instruction for 18 mins. Air Mechanic Bannister as passenger to Major Gerrard for 3 mins. On Short biplane 402, Lieuts. Bowhill, Glanville, Watkin, Roupell, and Unwin all making good flights of 10 to 30 mins. Sergt. Vagg made a good trip round the aerodrome, being 25 mins. in the air.

ROYAL FLYING CORPS.

THE following appointments, &c., appeared in the *London Gazette* of the 7th inst.:—

R.F.C.—Military Wing.—The undermentioned lieutenants are appointed Flying Officers, and to be seconded: Kennis P. Atkinson, Royal Artillery. Dated January 11th, 1913. George B. Stopford, Royal Artillery. Dated January 13th, 1913. Rutter B. Martyn, the Duke of Edinburgh's (Wiltshire Regiment). Dated January 14th, 1913. Dermott L. Allen, Princess Victoria's (Royal Irish Fusiliers). Dated January 15th, 1913. Reginald Cholmondeley, the Rifle Brigade (the Prince Consort's Own). Dated January 19th, 1913. Francis F. Waldron, 19th (Queen Alexandra's Own Royal) Hussars. Dated January 27th, 1913. John W. Pepper, Royal Artillery. Dated January 28th, 1913.

Special Reserve of Officers.—Sec.-Lieut. (on probation) Montagu R. N. Jennings resigns his commission. Dated February 8th, 1913.

FLYING AT HENDON.

THE week-end meetings at Hendon are already assuming a livelier tone, both as regards the flying that takes place and the number of visitors attending. Last Saturday certainly demonstrated this fact, for the thirty flights made during the afternoon were exceptionally good and varied, whilst the various enclosures contained a fairish number of visitors. The weather too, was much brighter, although there was a stiffish wind blowing. Just before M. D. Manton opened the proceedings, at 2.40 p.m., with a flight on the Grahame-White 'bus, George Temple made a short trial flight on his 35-h.p. Anzani-Caudron biplane—and flew it well, too, considering the short time he has had to practise on this machine. Manton's flight lasted about seven minutes, and terminated with a pretty spiral *vol plané* and an exceedingly fine landing. Marcel Desoutter next started away on the Blériot monoplane, but landed after completing half a circuit—presumably owing to engine trouble. He was up again almost immediately, however, and gave 10 minutes of his usual fine flying. Temple also made another short flight on his Caudron, and Manton ascended immediately after Desoutter, and went for a short cross-country flight over the Welsh Harp. While the last two were aloft, M. Richet and Lewis Turner each made flights of about five minutes, the former on the 110-h.p. Canton Unné (horizontal) Breguet biplane, and the latter on the 60-h.p. Anzani-Caudron. Richet was up again with a passenger shortly after, and then Lieut. Noel, of the Ewen School, went for the second part of his *brevet* and completed his first five "eights" in excellent style. Richet, in the meanwhile, made another passenger flight on the Breguet. Another passenger was then taken up by Manton on the 'bus, in the middle of which flight Desoutter started off again on his Blériot, remaining aloft for 27 minutes and executing some of his well-controlled evolutions. It was during this flight that nearly every available machine and pilot came into action, and Desoutter's flight seemed to start everybody doing it! Manton was making passenger flights—and dodging other machines—as was Richet, taking with him on one occasion Sydney Pickles, who enjoyed his experience immensely. R. Blackburn made a 23-minute flight on the Blackburn monoplane, performing some alarming manœuvres, the machine flying with an attitude resembling a tail-dive-side-slip. Lewis Turner on the 60-h.p. Caudron was also one of the merry party, while R. T. Gates gave an example of flying in rag-time on the 'bus. Truly an astonishing performance!

Desoutter, who had by this time completed his above-mentioned flight, put in another 12 minutes "stunting," while Claude Grahame-White, just back from Switzerland and looking exceedingly well, gave us a nice little flight on the 'bus. After this Manton made one more passenger trip on the 'bus, while Richet took up three, one after the other. A short flight by Temple and another rag-time exhibition by R. T. Gates concluded the day's proceedings. During some of his flights, Desoutter caused no small amount of interest by flying round and under both Manton's and Richet's biplanes.

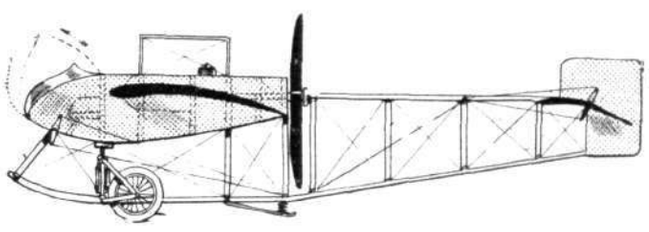
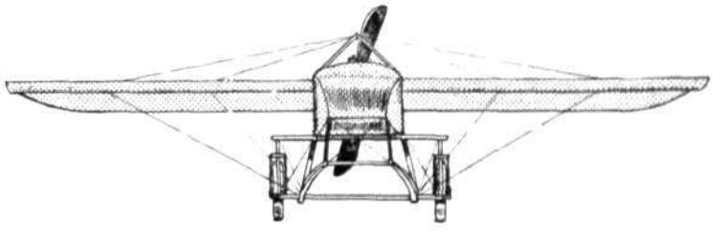
Several flights were made the following afternoon, Sunday, although the weather was not anything like so pleasant as on Saturday. Desoutter was on the Blériot monoplane, and Richet was flying the Breguet. Manton and Cheeseman made flights on the "G.-W." 'bus, while M. Baumann flew the Caudron biplane.


NEW 80-H.P. MILITARY GNOME-BLÉRIOT TWO-SEATER.

A NEW two-seater monoplane has been evolved from the Blériot works at Levallois Perret, and tested more or less secretly at Buc. In the rough side and front elevation sketches which we are able to reproduce this week, it will be seen that, in its lines, it is unlike any machine that has previously been turned out from these celebrated French works. The essence of the design is that the propeller is arranged to the rear of the body, so that the passengers, sitting in front of it, may have a perfectly clear view below, and in front of them. Arranged in this way, the machine becomes more capable of being used for offensive purposes than if the propeller revolved in front. Pilot and passenger are seated side-by-side in the front of the *fuselage*, while in front of them there is a wind-shield, which can be hinged forward so that they may have no difficulty in climbing in or out of the machine. Behind them are the fuel tanks and the 80-h.p. Gnome motor, the latter being supported on two bearings.

The body of the machine is really in two sections, the section which accommodates the passengers, the tanks and the motor, and that portion of the framework which carries the tail. This latter section is built up with three longitudinals, the upper one passing through the propeller-boss, an arrangement which is made use of on the 90-h.p. Grahame-White military biplane that is described elsewhere in this issue. A drawback to this method of arrangement is that if the propeller bearing ran hot, or if any vibration were set up owing to the propeller becoming damaged, it is likely that the upper member of the tail *fuselage* would become damaged and, maybe, lead to a collapse of the tail, with probably disastrous results. That the chances of an accident of this kind may be minimised, the propeller bearing of this new Blériot monoplane carries an electric detecter, in circuit with a small bell near the pilot which warns him should any undue vibration be set up or should the bearing tend to overheat.

The two lower longitudinals of the *fuselage* extend forward, forming short skids which are intended to protect the nose of the machine in the event of a heavy landing. A modified version of the standard Blériot landing gear is employed. Probably the most striking peculiarity of the machine is that the distinctive *cloche* control has been abandoned, and its place been taken by a vertical hand wheel. The rudder is still operated by the feet. Its main dimensions are a great deal bigger than the standard Blériot machines existing at the present time, and it is expected that this new Blériot military monoplane will have great things to show as regards weight lifting. It has a span of 12 metres and its overall length is 10·50 metres.

Front and side elevations of the new 80-h.p. Gnome-engined military Blériot two-seater, which is at present going through its tests at Buc, in France.




Royal Aero Club Dinner.

IT has been found necessary to alter the date originally fixed for the Royal Aero Club Dinner, which is now to be held on Thursday, March 13th, at the Royal Automobile Club, Pall Mall.

The Aero Show Race Meeting at Hendon.

FOR Saturday next, February 22nd, the concluding day of the Olympia Show, a special programme has been arranged at the London Aerodrome, Hendon. The main feature will be the Speed Handicap for the Aero Show Trophy, value 60 guineas, with 20 sovs. to the winner, and 10 sovs. to the second, to be flown in two heats and a final. The final is timed to start at 4.15 p.m., and it will be preceded, and followed, by exhibition and passenger flights by Mr. C. Grahame-White, and some of the competitors. During next week there will be flying every day from 2.30 to dusk, and passenger flights can be arranged for.

Gnome Motors.

IN our advance report in last week's issue of FLIGHT we described the Gnome engine exhibit, through an oversight, under the heading of the Aircraft Manufacturing Co. The particulars we gave should have been printed under the heading of the Gnome Engine Co., of 47, Victoria Street, Westminster, S.W., to whom all correspondence relating to Gnome motors should be addressed.

LEGISLATION AGAINST HOSTILE AIRCRAFT.

THE short Bill introduced into the House of Commons on Saturday morning by Col. Seely, Minister of War, read a second time on Monday and passed on Tuesday, is framed for the purpose of extending the power of the authorities so as to enable orders to be made prohibiting flying over fortified places. It also gives authority for attacking any aircraft which, when flying over prohibited places, does not land when signalled to do so.

The full text of the Bill is as follows :—

1.—(1) The purposes for which a Secretary of State may make orders prohibiting the navigation of aircraft over prescribed areas under the Aerial Navigation Act, 1911, shall include the purposes of the defence or safety of the realm, and, where an order is made for those purposes, the area prescribed may include the whole or any part of the coastline of the United Kingdom and the territorial waters adjacent thereto.

(2) The power of the Secretary of State under the said Act shall include power by order to prescribe the areas within which aircraft coming from any place outside the United Kingdom are to land, and the other conditions to be complied with by such aircraft, and if any person contravenes any of the provisions of any such order he shall be guilty of an offence under the said Act, unless he proves that he was compelled to do so by reason of stress of weather or other circumstances over which he had no control.

2. If an aircraft flies or attempts to fly over any area prescribed under this Act for the purposes of the defence or safety of the realm, or, in the case of an aircraft coming from any place outside the United Kingdom, fails to comply with any of the conditions as to landing prescribed by an order under the last foregoing section, it shall be lawful for any officer designated for the purpose by regulations made by the Secretary of State, to cause such signal as may be prescribed by those regulations to be given, and, if after such signal has been given, the aircraft fails to respond to the signal by complying with such regulations as may be made by the Secretary of State prescribing the action to be taken on such a signal being given, it shall be lawful for the officer to fire at or into such aircraft and to use any and every other means necessary to compel compliance, and every and any such officer, and every other person acting in his aid and by his direction shall be and is hereby indemnified and discharged from any indictment, penalty, action, or other proceeding for so doing.

3. This Act may be cited as the Aerial Navigation Act, 1913 ; and the Aerial Navigation Act, 1911, and this Act may be cited together as the Aerial Navigation Acts, 1911 and 1913.

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Cody among the Authors.

THE Authors' Club has a singularly attractive habit, which operates during the winter months, of inviting well-known men to be the guest of the evening at dinner—and to talk to them afterwards about their special subjects. On Monday last, this honour was conferred on Mr. S. F. Cody, who gave the members present an exceedingly entertaining time. In his own inimitable way, he regaled them with the essential facts of his life's history and accomplishments, many of which were illustrated by a series of lantern slides. Some of these pictures were really interesting, having been taken from kites at a great altitude. One or two showed Mr. Cody in his early glider, a pastime that some people have overlooked as properly to be numbered among Mr. Cody's early accomplishments, prior to the time when he developed his aeroplane.

The evening was highly enjoyable, and particularly so, for the excellent contributions to the discussion by Mr. C. J. Cutcliffe-Hyne, who admitted that he knew no more about the subject than he did about Capt. Kettle, but who succeeded, nevertheless, in making his audience believe that he had been seriously engaged for a long time past with the development of the most wonderful flying machine that ever could be. It would go up straight, it would go forwards, and, which seemed to be the greatest acquisition, it would go backwards. About the only thing not recorded of this aircraft was how it might come down, and that manœuvre, after all, is one of some consequence.

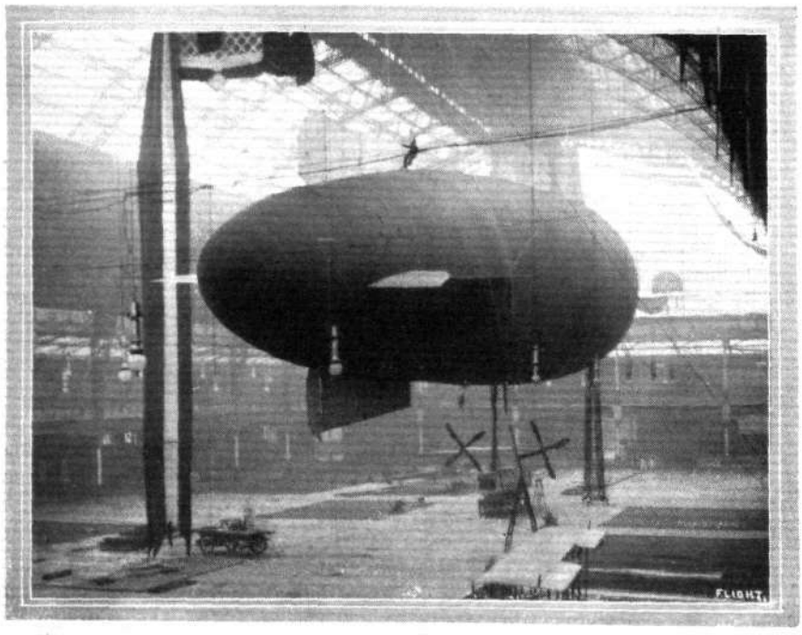
The Vice-Chairman, Mr. Charles Garvice, went even further than to merely talk about the aeroplane he had thought about. In conjunction with the Secretary, Mr. Algernon Rose, he had made an aeroplane, and in evidence of good faith, there was the machine hanging up on the ceiling for all to see. And so on, in the same strain, until more humour was extracted from the science of aviation than any other audience has succeeded in finding there yet.

Other speakers put on a serious mood, one asking about the inevitable parachute, whereupon Mr. Cody electrified the assembly by stating that it had always been his idea to carry a parachute coiled up on his head like a turban. He gave up the notion, however, when he came to have more confidence in his aeroplane. The idea of Cody, with a parachute coiled on his head, officiating in his "cathedral," like some high pontiff under a mitre, is a conception that only lacked the illustration of a lantern slide to be made perfect.

Mr. Esdaile had a variety of interesting things to say, and pushed India as a flying ground. His views on the subject, and the fact that he pioneered the aviation displays in that country, are well known to readers of FLIGHT.

Mr. Legros, Past President of the Institution of Automobile Engineers, discussed the quality of materials and the need for testing engines, while Mr. P. H. Edwards put in a very good and timely plea for the extended recognition of the national aspect of aeronautics—if you can't play, pay, sort of thing.

One way or another if the Authors' Club don't get a short story for a novel out of that Monday evening's entertainment, they ought to consider it rather poor business.



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Delta, one of the Army airships, being got into position under the great dome of Olympia for the Aero Exhibition which opens this week.

The R.Ae.C. Telephone Numbers.

NEW telephonic facilities have had to be arranged for the Royal Aero Club, and our readers should note that there are now two lines available—Regent 1,327 and 1,328, the old line, Mayfair 1,643, being discontinued.

FLIGHT Stand at Olympia.

DURING the Olympia Show next week, FLIGHT will be at the same stand as at previous shows—*i.e.*, the first to the right just inside the Addison Road main entrance, the number of which is now 26. We cordially invite our readers to pay a visit to this stand, where they will find a very interesting selection of photographs on view.

An Italian Branch of the G.A.C.

MR. D. LAWRENCE SANTONI, who has been in Italy since early in the New Year, has founded a branch of the General Aviation Co., in Milan, under the title of the Agenzia Generale Fourniture Aeronautiche. Already the firm has transacted considerable business with the Italian Government and has a large number of important orders in hand. Any firm desirous of being represented in Italy, and the Italian colonies, should apply to the headquarters of the G.A.C., at 30, Regent Street, London, W.

FLIGHT

STABILITY DEVICES.

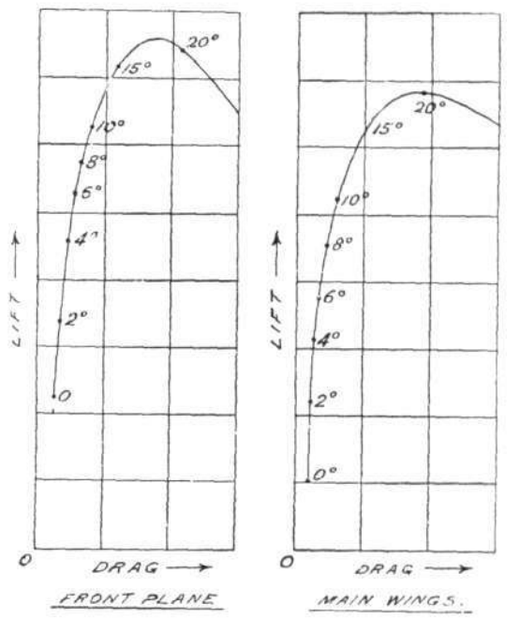
By MERVYN O'GORMAN.

Paper read before the Aeronautical Society on Wednesday, January 29th, 1913, Brig. Gen. D. Henderson, D.S.O., C.B., in the Chair.

(*Continued from page* 161.)

Thus in Fig. 5A a change, not impossible if we consider up-gusts, of 9° of attitude, say from 6° to 14° for the small plane, makes far less difference of lift to it than the same change from 3° to 11° for the main wings. This, in the case of up-gusts is valuable and apparently can be got without sacrificing the normal good effect of the upturned Vee for speed maintaining.

In one example, the Drzewiecki, the curve adopted for the front plane (working at 8°) is Fig. 5A in conjunction with main wings having the characteristics of Fig. 5B, but working normally at the angle of 5°.



Figs. 5A and 5B.—Diagrams of lift and drag on two planes, so chosen that an angular variation of attitude makes less change of lift in the front plane.

21. **Engine Control.**—No "stability" patentee who has sough constant speed by controlling the throttle from a pressure vane, or velometer, is very actual because the engine is to be regarded as unreliable and the maintenance of speed by diving must, in any case, be resorted to when the engine stops, *i.e.*, when throttle opening would be useless. With multiple engines in the future, such may be a simple and potent remedy and not the absurdity which it sounds now.

22. **Screw Propulsion** has an inherent tendency, though a sluggish one, to favour the constancy of the aeroplane's air speed because a screw gives less pull during a head-on gust, and more during a following gust, as may be easily appreciated by considering the effect of a gust either way on the propeller's slip stream, or more easily, from the common experience that a propeller speeds up in a head-on gust, thus proving that the engine has been momentarily relieved of its load. The situation of the propeller in front has, for this reason, an earlier steadying effect, and therefore a more useful one than if placed behind. Though possibly this is insignificant in practice, now it does not follow that it cannot be made greater with special propellers. Also the placing of a pair of propellers, one in front of each wing, for the same reason assists slightly in the constancy of the air speed over each wing, a feature which has either escaped the observation, or at least any mention from those who utilise this arrangement. Lastly, if the line of the screw thrust is below the centre of gravity the movement of the mass under its inertia tends to equalize the speed, by causing a pitch down when the engine fails and up when its pull increases.

23. **Multi-Blade Propellers for Safety.**—I cannot refrain from touching, by the way, on the terrific vibration caused by the breakage of one blade of a two-blade propeller with the consequent engine-racing. The pounding on the engine-fixing endangers the *fuselage*, and with it any wing supports referred thereto and thence the pilot. The multi-blade propeller exercises less thrust per blade, so that the engine races less on breakage, the out-of-balance thrust is less and the out-of-balance mass is less. All these make for safety. Moreover, the blade width being less propeller flutter is less, and so are the pulsations due to the blades passing a fixed object such as the wing spar and gyroscopic flutterings on yawing. For these and other reasons the Royal Aircraft Factory stuck to the four-blader when it was discountenanced in France and England generally owing to Breguet's and other makers' early difficulties. An increased cost of a few pounds is involved, but I do not believe this system of skimping the money for aeronautical work can long be allowed to continue, when the effect of it is fully realised to be additional risks to the flyers.

24. **Flywheelage, or Moment of Inertia.**—The less the flywheelage of the aeroplane round the axis parallel to the wing spar and the larger the tail the less the pitching movement will oscillate. It is a pity that very little is known or published about the moment of inertia of various aeroplanes. To give a concrete basis of comparison I mention that B.E. 2 has a flywheelage of 42,000 lbs. feet squared, a tail with a moment of inertia of 21,000 lbs. feet squared round the same axis and a tail area of 52 sq. ft. (a large tail area compared to most of the usual aeroplanes).

It is not generally known that man is so constituted that his sensations in regard to the speed he is travelling at only inform him of a change of acceleration. A quick rate of change is much noticed, a slow change nearly escapes his attention. For this and other reasons the balance of advantage in favour of keeping the external weight as near the axis passing through the centre of mass as possible is a strong one, and the more strong if the stability is not automatic. It is to be observed that the force available for restoring balance is limited to that afforded by warping the wing or pulling the flap combined with operating the rudder, say, 30 lbs. acting at about 15 ft. in an ordinary case for flap movement, while the time allowable for recovery may also be limited by the nearness to the ground or to an obstacle.

Quick response of the aeroplane is therefore doubly valuable both in the detection of the disturbance and in its remedying, and from this follows the utility of concentrating masses near the centre of gravity, especially as regards laterally arranged masses.

25. It has often occurred to me that, owing to the extreme urgency of getting practical results and the unfortunate and discouraging publicity which attends any originality, no one has yet attempted the slow research based upon making what might be called a symmetrical aeroplane, not because such an aeroplane is probably good, but because we could, from such an aeroplane, make departures one at a time, leaving everything else symmetrical and constant, thus disentangling the skein of causes and effects.

By symmetry I mean not only geometrical form of body, wings and tail, but the alignments on the axis of the propeller thrust on the axis of form, and placing there the c. of g.; balancing the drag so that the resistances and their moments round the c. of g. were equal, balancing fin area equivalents above and below, as well as fore and aft of the c. of g.

This still leaves the lift resultant movable fore and aft with changing attitudes, and it also allows the drags on the two wings to be unbalanced on turning and on warping.

Something has been done on this latter point which belongs properly to a paper on "devices."

26. **Asymmetry of Wing Resistances.**—The inequality of drag which exists between a flap warped to lift and a flap warped to depress is notorious, and is undesirable since it occurs usually on the wrong wing and therefore calls for a correction by ruddering, with consequent loss of speed. In May, 1911, Mr. V. Gregory brought before me two methods of meeting this; one by introducing a differential gear in the controls,* the other by cross-connecting the wires to the flaps so as to achieve equality of pull upon them. This secures an approach to balance of drag. The balance is more closely exact between the plus and minus *lift* of the two flaps, but the resistance, or drag, may for his purpose be taken as proportiona to the lift and therefore balanced when the plus and minus lifts are balanced. Fig. 6 shows the cord connections which give the equivalent of a differential.

27. If, as may prove to be the case, the future of flight depends upon the utmost refinement of balance and the minimum call upon the flyer to compensate for imperfection of the machine, a system of connections of some such kind, securing equality of drag, may yet find its way into practice, at any rate some part of the mechanical difficulty has now been ingeniously dealt with.

* I have since learnt that a somewhat similar idea was evolved by Mr. Hulbert in U.S.A.

(*To be continued.*)

AERONAUTICAL ENGINES.

Paper read by A. GRAHAM CLARK before the Institution of Automobile Engineers.

(*Continued from page* 130.)

The 60-h.p. Sturtevant Engine shown in Fig. 20 and Fig. 21, is in all respects, excepting that of the means by which the water circulating pump is driven, an engine of the standard car type, in which weight has been reduced by the employment of high grade materials. The ultimate tensile strength of the steels used is 56 tons per sq. in., while the cylinders and pistons are cast from semi-steel having an ultimate tensile strength of 18 tons per sq. in. It

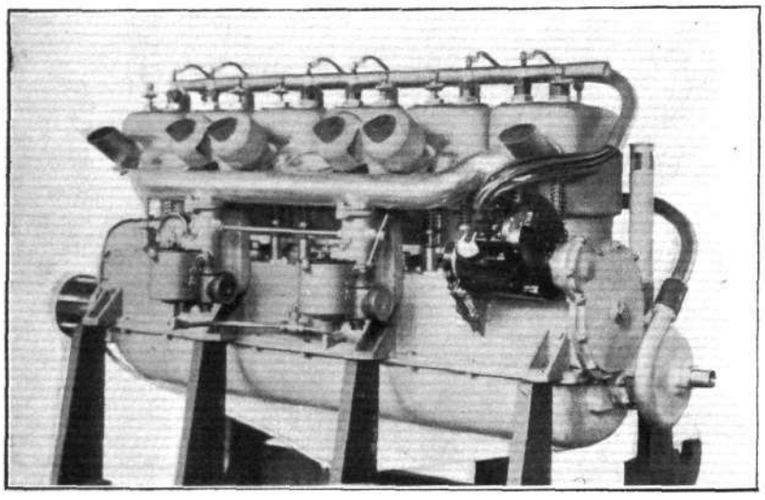


Fig. 20.—60-h.p. Sturtevant engine.

may, however, be remarked that the high brake mean effective pressure indicates that an extremely high compression is used. With regard to the wearing qualities of the engine, it would seem to be desirable for the side thrust on the piston to be taken on bearing rings, rather than on the body of the piston itself. All parts subject to atmospheric influences are nickel plated as in the Hall-Scott motors.

The 120-h.p. Wolseley Engine is illustrated in Fig. 22, from which the general construction is apparent. It should be observed that provision is made to prevent the diversion of the water into one set of cylinders in the event of a steam lock being formed in the other set, by taking off the leads to the cylinders from two different points on the periphery of the pump case. Steel pistons and cylinder walls are employed, but they are kept from coming into contact with one another by the use of two phosphor bronze bearing rings. It would, however, seem to be preferable to bolt or otherwise secure the head to the barrel, rather than to rely upon a thread in cast iron for a part subjected to the full explosion pressure.

Bosch dual ignition is fitted; air is taken by the engine from the crank-case, and the remarks made anent a similar arrangement in the Dorman engine will also apply here.

Desirable Qualities in an Aero Engine.

Having dealt with the principal features of representative types of engines, the qualities it is either desirable or essential that an aeronautical engine should possess will be considered. They are:—

1. Reliability.
2. High power/weight ratio.
3. Economy in fuel and oil.
4. Low air resistance.
5. "Controllability."
6. Freedom from vibration.
7. Accessibility.
8. Silence.
9. Cleanliness.

The need for the first requirement will at once be obvious, as the failure of the engine necessitates the immediate descent of the machine, if of the heavier than air type, which, should it occur at an inopportune moment may be attended with disastrous consequences. Hence, reliability must be placed above all other considerations.

High power/weight ratio and economy in fuel and oil consumption are desirable because of the increased radius of action possible with an engine possessing these qualities, while, in addition, the presence of excessive quantities of oil in the cylinder is a fruitful cause of irregular firing, and consequently falling off of power.

The importance of air resistance becomes more marked with increase in the speed, as the power absorbed in this direction varies as the cube of the velocity; since many designers are raising the speed of their machines for the purpose of obtaining greater stability, the higher powered engines which result from so doing will render it necessary that a greater amount of attention shall be paid to the question in the future. It may be remarked in this connection that the horse-power required to propel a flat plate 3 ft. in diameter through the air is increased from about 6 to over 16 by increasing the relative velocity of the plate to the air from 50 to 70 miles per hour.

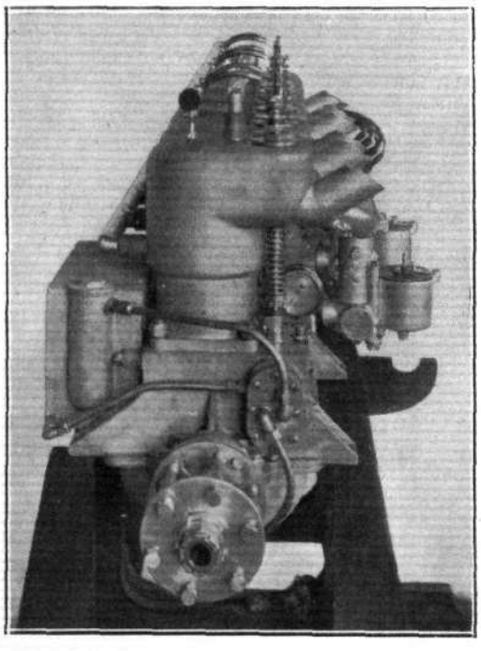


Fig. 21.—60-h.p. Sturtevant engine.

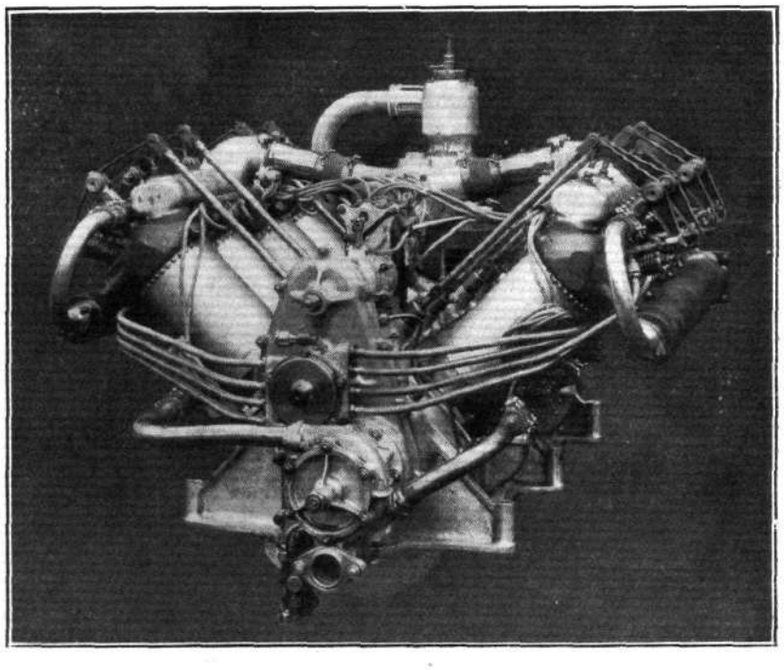


Fig. 22.—120-h.p. Wolseley engine.

With regard to "controllability" or flexibility, although there is not the same need for this as with engines employed on automobiles, it is none the less a desirable quality since at low speeds of rotation the propulsive or tractive effort of the propeller is insufficient to move the machine along the ground, and hence the pilot will be able to start up without assistance should circumstances necessitate his so doing. Further, as the engine is not required to develop its full power during horizontal flight and when alighting, the ability to vary the speed during descent is certainly preferable to the crude methods of switching the ignition off and on. These remarks will apply principally to aeroplane requirements, but in dirigible work such a quality will be an advantage because of the easy acceleration that can be given to the vessel without undue stressing of any part, as well as on account of the desirability of varying the speed while observations are being made.

The necessity for the elimination of vibration as far as possible will be obvious when the slender nature of the supports upon which the engine is carried is realised, especially as vibrations of an objectionable character may be set up in the various parts of the machine.

The question of convenience of access is frequently overlooked or, any rate, disregarded on account of the care and attention which is now given to this class of engine before any extended flight is made. But it must be realised that from commercial considerations alone, apart from the addition to the time during which the machine can be used, and which may, under some circumstances, be of value, it will be an advantage to be able to readily examine or dismantle any part, especially when the applications of the aeroplane are more widely extended.

Silence is desirable in any mechanism used for pleasure or sporting purposes, but when it is intended for employment on military reconnaissance duties it becomes of increasing importance to be able to manœuvre without giving audible warning of approach, especially at night.

Cleanliness is in the nature of a refinement, but it is none the less necessary, since a dirty appearance is generally caused either by the oil splashed about during hand oiling or by the exhaust, both of which are objectionable, the former because the part requiring such attention is apt at times to run dry owing to the irregularity of the supply of lubricant, and the latter because it indicates an open exhaust.

(To be continued.)

FOREIGN AVIATION NEWS.

The French Naval Competition.

THE Aero Club of France committee which is drawing up the rules for the competition for the 50,000 francs trophy and cash prizes offered by the Minister of Marine for hydro-aeroplanes, has drawn up a long list of tests which will be imposed. These comprise a distance test of 250 sea miles and a speed test over 100 sea miles. There will also be special tests for navigability, gliding, rising and alighting. The machines, which will be divided into two classes, coast machines and open sea machines, will also be tested on calm and rough seas, the height of the waves being recorded in the latter case.

Military Aviation in France.

A SPECIAL committee has been appointed to make a full inquiry into the whole subject of French military aviation, with a view to reporting as to what steps can be taken to place the service upon a proper footing. In some quarters it is held that the time has now come for aeronautics to be fully recognised as a separate arm, in which officers and men would perform the whole of their military service. The committee is visiting the various aviation centres, and making inquiries as to the conditions under which the aviation corps is working at present.

New President of French Aero Club.

As was expected, M. Henry Deutsche de la Meurthe was elected on the 6th inst. to succeed the late M. Cailletet as President of the Aero Club de France. Readers of FLIGHT and the *Auto.* know how much aeronautics in France, and the world over, owes to the work and generosity of M. Deutsche, and it will be recognised that a better choice could hardly have been made. One of the most valuable gifts to the cause is the Aerotechnic Institute, in connection with the Paris University, at St. Cyr. M. Deutsche was recently created a Chevalier of the Legion of Honour.

Contest Awards and New Records Passed.

AT the meeting of the Commission Sportive Aeronautique on Monday, the Criterium of the Ae.C.F. was definitely awarded to Fourny for his flight of 1010·8 kiloms. on a Farman machine. The Archdeacon Cup was definitely awarded to Henry Farman and the Lalance prize to Bonnet.

Formal recognition was given to Vedrines' speed records made on a Deperdussin monoplane of 250 kiloms. in 2h. 1m. $53\frac{8}{10}$s. and 246·937 kiloms. in 2 hours, and Legagneux's passenger record of 3,670 metres, made on a Morane monoplane.

Preparing for the Gordon-Bennett.

INSPIRED no doubt by the munificent offer of 100,000 francs, by M. Deperdussin, the commercial men of Rheims and the district are contributing liberally towards the prize fund in connection with the Gordon-Bennett aviation contest, which will be held at Betheny this year. Already the amount promised is 250,000 francs, and it is expected that the final sum will be round about 300,000 francs.

Another Prize for Garros.

IT will be remembered that last year the Grand Prix of 10,000 francs of the French Academy of Sports for the best performance in any sport during 1911 was awarded to "Beaumont" in respect of his various long flights. This year the prize, which is due to the generosity of M. Deutsche de la Meurthe, has been awarded to Garros. His noteworthy performances of the year 1912 included twice beating the height record, the winning of the Ae.C.F. Grand Prix, and the flight from Tunis to Rome.

New Passenger Height Records by Gougenheim.

AFTER making a splendid performance on Saturday by taking up four passengers to 752 metres, Gougenheim handsomely bettered this on Monday by taking up a similar load to 1,120 metres. His mount was a Henry Farman biplane fitted with 80-h.p. Gnome and Chauviere Integrale propeller, and both performances were made at the Villesauvage Aerodrome near Etampes. On Saturday the passengers were MM. Gressard, Dufaure, Jousse, and Leclerc, and when a height of 752 metres had been reached, it rained so heavily that it was deemed advisable to land after being in the air for an hour. The passengers on Monday were MM. Ferdinand d'Or, Germain, Vauger and Richerolle and the machine carried 70 kilogs. of fuel and oil. During the flight of 1 hr. 40 mins. the greatest altitude reached was 1,120 metres. The previous height record for pilot and four passengers was 590 metres made by the Belgian, Verschaeve.

Clement-Bayards Over Paris.

IN connection with the Mardi Gras festivities in Paris on Tuesday of last week, Guillaux and Gastinger appeared at a height of 2,000 metres over the French capital on their Clement-Bayard monoplanes. Both pilots also took passengers for trips over the city on the following day.

The new uniform badges for the Aeronautical Section of the French Army.

Flying to Lunch.

IN response to an invitation by M. George Leys, Maurice Farman, with two friends, MM. Bernard and Doncker, flew over from Buc to Allos Castle in Sologne on the 5th inst. After lunch they started on the return journey, making a call at the Farman school at Etampes, and then continuing by way of Dourdon and Chevreuse.

Touring on Blériots.

CONTINUING his series of long cross-country trips on his Blériot monoplane, M. Etienne Giraud, with his mechanic, covered 150 kiloms. on the 5th inst. Leaving Buc, they passed over Versailles and the Marly Forest, then along the Seine to Medan, Meulan and Mantes, turning above the aeronautic park at Moissan. The return trip was by way of Septeuil and Neauphle-le-Chateau. A similar voyage was made on the following day, and on Saturday last he went over to Etampes. Against the high wind 1 hr. 15 mins. was taken for 50 kiloms. on the outward trip, but flying back only took 20 mins. On Monday a trip was made to Melun and back.

Baron Pasquier has also made some good flights recently. On the 6th he made a circuit from Buc over St. Germain and Poissy, and in the afternoon he went from Buc to Rambouillet and Chartres and back by Etampes.

Long Flight by Capt. Bellenger.

AMONG the arrivals at Buc on the 6th inst. was Capt. Bellenger, who had flown over—on his Blériot, of course—from the aviation centre at Avors, near Bourges, representing a journey of 250 kiloms. On Monday he left Buc, at 1.10 p.m., on the return trip, and at 2.35 landed at Orleans. Getting away again at 3.24, he landed safely at Avors at 4.50 p.m.

Good Work on Caudrons.

AMONG the many fine flights seen at Crotoy recently three were made on the 6th inst. when Corpl. Strohl made a trial of an hour and a half on his Caudron, and Lieut. di Bihan and Sapper Desfougere were each up for three-quarters of an hour, their altitude varying between 900 and 1,200 metres.

More Deperdussins for French Army.

ON the 7th inst. at the Betheny aerodrome, Janoir was testing an 80-h.p. Deperdussin two-seater before a French military commission headed by Capt. Destouche before handing over to the aviation corps at Rheims. A single-seater with 50-h.p. Rhone motor was similarly tested and climbed 60 metres in 5 minutes.

Labouchere on a Farman.

ON the 7th, Rene Labouchere completed a long voyage on a Maurice Farman machine, arriving at Villacoublay from Tours, the time taken being an hour and a half, and the speed was said to be 130 k.p.h.

Long Flights Over Frontier.

LIEUT. GAUBERT, who is attached to the Belfort garrison, made reconnoitring flights of over an hour on Wednesday and Thursday of last week along the Alsatian frontier.

Good Work at Farman School.

FROM Etampes, on the 7th inst., Corbeil flew on his Farman machine to Chartres and back, and Lemaitre made a flight of an hour's duration between a height of 800 and 1,000 metres.

A Farman School at Boulogne.

IT is stated that Henry and Maurice Farman have decided to make Boulogne-sur-Mer their headquarters for experiments and trials with hydro-aeroplanes, &c.

Henry Farman Weight Lifting.

CARRYING out experiments in view of the forthcoming hydro-aeroplane competitions at Monaco, Henry Farman at Etampes on Saturday on one of his machines carried a load of five persons, a weight of between 515 and 520 kilogs. in addition to a full supply of fuel and oil. In spite of the weight the machine "took off" in splendid style, and landed easily.

Delivery by Air.

HAVING two 80-h.p. H. Farman machines to be delivered at Etampes, Henry Farman and Chevillard determined to take them over from Buc by the air-way on Saturday. One of the machines—which were for the French Government—was tested by Chevillard, and, with a load of 275 kilogs., it climbed 540 metres in 6 mins., while the speed was said to be 100 k.p.h.

A Deperdussin at Nice.

SOME splendid flying has been done at Nice by Laurens on the Deperdussin hydro-aeroplane, and a very large number of passengers have been carried. On the 4th inst. Laurens, accompanied by a passenger, took part in the second battle of flowers, flying for twenty minutes at a low altitude.

Rheims to Maubeuge on a Dep.

LIEUT. BROCARD, with a brother officer on the 7th inst. flew from Rheims to Maubeuge on a 80-h.p. Deperdussin two-seater, the trip taking an hour and seventeen minutes.

Seven Machines in Company.

AT Cercottes Camp, on the 6th inst., was seen the sight of no less than seven aeroplanes arriving in company, including six Maurice Farman biplanes and one Borel, all of which were piloted by military officers and had come from Chartres. On the same day five military pilots, each with an observer, flew from Villacoublay to Rheims on Nieuport monoplanes.

Fast Flying in Algeria.

ON the 3rd inst., Lieut. Reimbert, on a 80-h.p. H. Farman, flew from Biskra to Ouled d'Jellah, covering the 90 kiloms. in 45 mins. He had as passengers on the machine Sergts. Hurard and Benoist.

A Frontier Flight.

LEAVING Toul on the 7th inst. on his Henry Farman machine, Corporal Foulquier with Corporal Danty flew along the frontier, and landed at Nancy. Subsequently he was flying over the town.

Landing in Small Space.

BRINDEJONC DES MOULINAIS, starting from Villacoublay on his 50-h.p. Morane-Saulnier monoplane, made a fast trip to Chalais-Meudon, where he landed in the open space in front of the dirigible shed, the machine easily pulling up in the 60 metres available. He also got away again easily and returned to headquarters.

Cross-Country on M. Farman.

MAURICE FARMAN, on Monday, flew over with Senouque to Tillieres to lunch, and returned to Buc during the afternoon. Lieut. Cesari also went on his M. Farman to Cognac, and Adjudant Parent, on a similar machine, went to Sissonne Camp.

A Double German Fatality.

WHILE a hydro-aeroplane, presented to the German Navy by the National Fund, was flying at Zoppof, near Dantzig, on the 7th inst., it suddenly dived into the sea, apparently through a wing breaking, and the pilot, Capt. Jenetzky, and passenger, Engineer Dieckmann, were both drowned.

The Italian Military Competition.

THE committee appointed by the Italian Minister of War has now drawn up the scheme for the military trials for Italian-built machines. The machines will be mechanically tested at the Mirafiori aerodrome, Milan, while they will be required to make a practical test over a circuit from Turin to Milan and back, during the last ten days of April. The round trip of 300 kiloms. may be made in two stages, one from Turin to Milan and the other from Milan to Turin *via* Casale. The trips must be made at a minimum height of 800 metres, and the maximum time for the round trip is fixed at $5\frac{1}{2}$ hours for monoplanes and $6\frac{3}{4}$ hours for biplanes. The winners in each class will receive a prize of £800 and an order for seven machines, while other machines "placed" will receive £800, but no order.

An Exhibition for Turin.

THE Automobile Club of Turin is organising an aviation exhibition which will be held from May 17th to June 1st in the Palazzo Stabile, in the Valentino Park.

Deperdussins in Spain.

LAST week Prevost carried out some splendid flying at the Madrid Aerodrome on his Deperdussin two-seater, and on Saturday the King of Spain witnessed several flights, afterwards congratulating the pilot upon his skill.

Bider to Fly Back to Pau.

NOT content with having flown over the Pyrenees from Pau to Madrid, Bider proposes to return by the same way, but in stages, giving exhibitions on his Blériot monoplanes at the more important places, such as Valladolid and St. Sebastien.

Flying in South Algeria.

LIEUT. MAGNIEU attached to the French military garrison at Oudjda on Sunday flew from that place on his Deperdussin monoplane to Taourirt and back, taking 2 hrs. 20 mins. for a distance of 200 kilomns. Lieuts. Jeanneraud and Bruncher, also on Deperdussins, went from Oudjda to Naima and back.

Chinese Military Aviation.

IT is understood that the order for a dozen Caudron biplanes, just placed by the Chinese Republican Government, is but the commencement of the organisation of a large flying corps. It is expected that during this year some 270 machines will be ordered, and 700 during the next three years. Lieut. Bon and the Caudron pilot, Obre, with two trained mechanics, have been appointed to the new school which is being started at Pekin, and Chinese pilots and mechanics are to be trained as rapidly as possible. It is stated that the Chinese Government has taken these steps at the instigation of its French military adviser, Commander Brissand-Desmaillet.

Flying Forbidden Over Hong Kong.

IT is reported that the Legislative Council of Hong Kong has orbidden the flying of aeroplanes over the colony unless special permission be obtained. The punishment for infractions of the law is a fine of £100 or three months in gaol.

Models

Edited by V. E. JOHNSON, M.A.

The Aero Show at Olympia. Model Section.

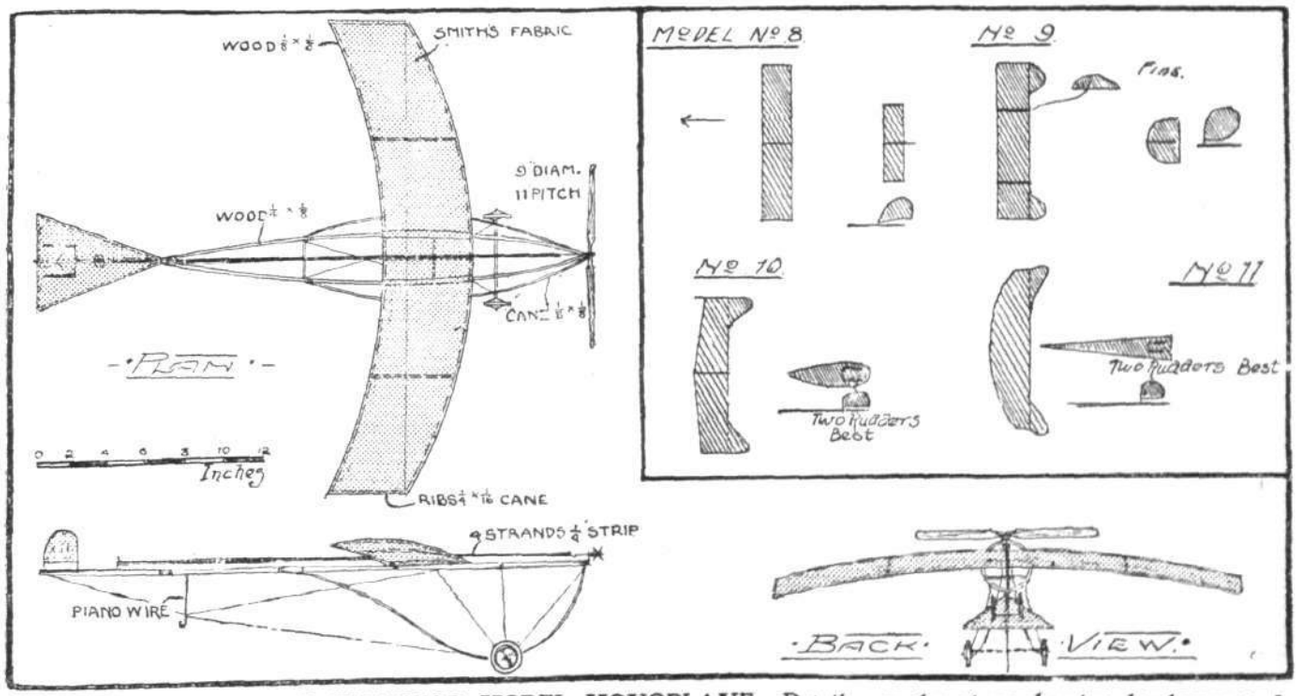
By the time that the following lines are in the hands of our readers, the Aero Show will already have been opened, and some, at any rate, of those who peruse these lines will have seen for themselves what undoubtedly is the finest show of aeronautical models yet exhibited. In mere number they constitute above a hundred more than those exhibited at the last Olympia Aero Show; this fact, interesting in itself, might mean but little, and it is one on which we have no desire to lay undue stress. At the same time, it has a special interest of its own, showing as it does that model aeroplaning is not, as some would have us believe, a subject of waning interest, but one which possesses a large number of enthusiasts—because for each exhibitor one must reckon scores of interested advocates.

Two years have passed since the last Show. The mere toy model has had its day, and its place has been taken by the scientific model, the proper value of which is at length beginning to receive its true and correct appreciation. Save in Section 4, all the models have to show their capabilities in actual flight as well as in construction and design, and in Section 5 the motors have to prove their efficiency as practical motors under test conditions. This means that we have the aero model at its best, as a practical adjunct to the study of problems in aviation, in which so many yet await solution, in spite of the enormous strides that have already been made.

In addition to the exhibit being essentially one of practical scientific flying models, there are several other special features which distinguish it from previous exhibits of a similar kind. At the time of the last Show the model hydro-aeroplane was non-existent; at the present time, although by no means so common as the ordinary model, it has been developed to a no mean state of perfection, and is quite well represented, the effect of the numerous models shown floating on the water being both realistic and pleasing—in fact, without exaggeration, one might term it one of the minor features of the Show, and will be, amongst other things, an excellent test of the "seaworthiness" of the models.

Another feature to which we would draw special attention is the exhibition of a number of power-driven models, which have shown themselves capable of rising either off the land or water, and making a free flight solely under their own power. At previous exhibitions there have, of course, been models fitted with engines, but perhaps the less said about their flying capabilities the better. So far—in Great Britain, at any rate—no power-driven model has been fortunate enough to do anything much in open competition. It is certainly to be hoped that at the actual flying tests of the exhibition models to be held at Hendon at the end of February that this stigma will be removed. Only those who have experimented with such models can possibly realise how great the difficulties are.

Another special feature, and one which we hope to see still further developed at forthcoming exhibitions, is the club exhibits. The number of clubs exhibiting is not, it is true, large, and some well-known ones are only "conspicuous by their absence"; nevertheless, it is a beginning, and the idea is certainly one that should be encouraged and developed. In addition to the above, there are also on exhibition a limited number of non-competitive models, which possess some especial feature of interest by reason of having distinguished themselves in open flying competitions, being the first successful model of some particular type, &c. The classes into which the model section is divided *have* of course exercised a marked effect on the character of the exhibits—in the main, we should say, a good effect, although one must confess one would have liked to have seen a separate section for tractors, could such have been arranged. The qualifying test of 30 secs. has undoubtedly kept many from exhibiting in this class, and some competitors who would have built tractors have, we know, constructed other types. Considering the value of the prizes that are being offered *plus* the kudos conferred on the winner, together with the standing of the Exhibition, we certainly do not see that a lesser qualifying duration test could have been imposed. Certain critics have not failed to point out that in the Wakefield competition (held in the summer months, and with the same weight minimum, viz., 8 ozs.) no machine made a duration of 30 secs., and that such is scarcely likely to be done in the case of models possibly showing more detail, and in the winter months. Accompanying this criticism naturally comes the query, What is going to happen supposing no model is successful in making the qualifying test? Personally we fully believe that a certain number of models will accomplish this, without any great difficulty, unless the weather conditions should be (as they were in the case of the Wakefield competition) very unfavourable. After all, surely the matter is one



C. C. HORNER'S No. 12 TRACTOR MODEL MONOPLANE.—Details are also given showing development of model. Model No. 8 was tried with the tails and rudders of Nos. 9 and 10. All the models went through similar experiments. Every model was the same length, and all the main planes had a dihedral angle. No. 11 was the best, barring No. 12, which was final.

which can be safely left to the discretion and common sense of the judges. We would just like to state that we accept (*pro tem.*) our critic's statement *re* duration as correct, not having the actual times by us for reference.

It is certainly to be hoped that the Kite and Model Aeroplane Association, which is officially assisting in this section of the Exhibition, will in consequence be able to add very considerably to its membership and that a commencement at any rate will be made with a fund for the purpose of holding some time this year a real International Model Competition which could not fail to arouse considerable interest in this branch of aviation, amongst those who have so far taken little or no interest in it. All visitors to the Exhibition should not fail to take away with them one of the K. and M.A.A. leaflets; even if not personally interested, there is every possibility that some friend would be.

As it is the intention of FLIGHT not only to deal more or less in detail with this section of the exhibition, but also to publish a special supplement giving further details, photographs, scale drawings, &c., of the principal models as soon as possible after the flying trials have been held and the awards decided; it is not necessary to add anything further to the above, except to say that it is our honest and unbiassed opinion that any aeromodellist who could visit the exhibition but fails to do so will certainly live to regret it.

A 2-oz. Model Tractor.

We gave in last week's issue a description and scale drawings of a 12-oz. tractor; this week we do the same with respect to a 2-oz. one, as we know there are a number of readers who are interested in small models, which are not, of course, without their uses and conveniences. In his communication, Mr. C. C. Horner says: "I kept strict notes of areas and sizes of planes used; also the changing of one plane for another, of all alterations made in the rudders, tail, &c. I made no less than ten small planes and the same number of tails, and the model illustrated is the outcome of a large number of experiments, my idea being to obtain the most practical model for the least possible weight.

"*Fuselage.*—After experimenting with several types, I chose the one now used, and illustrated, as it had several advantages compared with either the one in which the single stick is used or two curved ones running side by side, viz. (A) strength; (B) the mainplane rests firmer than on a single stick, and it is easier to move to and fro along the longitudinal frame; (C) the tail works in less disturbed air than when two longitudinals are used running the full length of the model, as the single stick under the tail tapers from $\frac{1}{4}$ in. by $\frac{1}{4}$ in. to $\frac{1}{4}$ in. by $\frac{1}{8}$ in., and is circular on the underside; (D) no extra weight is carried except where absolutely necessary due to strain; (E) shows only a slight tendency to twist under torsional forces due to rubber strain; (F) small head resistance due to shape and lack of bracing as is necessary in single stick type.

Main plane.—Principal characteristic is its backward sweep (see plan); this shape was chosen as it was found that it had a decided advantage over a straight plane in the matter of showing greater longitudinal stability—especially in a strong wind. For lateral stability the usual type of dihedral angle is employed.

Tail.—This part also had its share of time spent on it, and it was found that a long narrow plane as now used worked in better harmony with the type of plane before described than a Blériot type, where the length ran across the flight path rather than with it—this type seeming to rise and fall the whole time, although no general effect was apparent with respect to the model except that in a wind a sharp nose dive often occurred—which does not happen with the type here advocated, this type always flying level to the flight path.

Rudders.—I found two rudders side-by-side far more sensitive than one larger one of the same area, also that they kept the model more stable. The larger one affected the model most when banking, causing it to side-slip far more than the two did.

Landing devices may be summed up as follows: (*a*) very strong and light, yet supple and springy; (*b*) small head resistance, and easily attached to the frame; (*c*) Clarke disc wheels used, which are neat and suitable in every way. [A fault in this part of the design appears to be the absence of a forward skid to protect the propellers when landing.—V.E.J.]

In conclusion, the model is a good flyer up to 150 to 200 yards, and is very stable longitudinally and laterally, and is also in proportion to a full-sized machine as far as possible; the power used is small, and it rises from the ground quite successfully. Total weight complete, 2 ozs.

Materials.—Wood *fuselage*, $\frac{1}{4}$ in. by $\frac{1}{4}$ in., $\frac{1}{8}$ by $\frac{1}{8}$, and $\frac{1}{4}$ by $\frac{1}{8}$. Main planes, $\frac{1}{8}$ by $\frac{1}{8}$; fabric, Bragg-Smith proofed silk; cane tail plane, $\frac{1}{4}$ by $\frac{1}{8}$; ditto landing device, $\frac{1}{8}$ by $\frac{1}{8}$. Wire rudders, $1\frac{1}{2}$ in. by 2 in., same fabric as on main plane. All joints bound and glued, complete model stained and varnished. Propeller, wood, 9 in. by 1 in., 11 in. pitch.

A Correction.

Mr. J. H. Dollittle has asked us to state that he is not, and never has been, a member of the South-Eastern Model Aero Club, as we stated in last week's issue; the only club of which he is at present a member being the K. and M.A.A. We find, on reference to Mr. Clark's original communication, that he certainly did not specifically state that Mr. Dollittle was a member. The error into which we fell was not, however, we think, an altogether unnatural one.

The Broadstairs Model Co.'s Catalogue.

We have received from the above firm (10, Broadway, Broadstairs) a copy of their illustrated catalogue of model aeroplane accessories and materials. As well as finished models of the usual type, the firm also supply parcels for constructing their racing monoplanes, &c. Also rubber; half-a-dozen different covering fabrics, both proofed and unproofed, wood for frames, &c., bamboo, ash, birch, silver spruce; the usual fittings: wheels, wire strainers, and propeller bearings; a very neat and strong combined winder and hand drill, propellers, some well-designed floats for model hydro-aeroplanes, constructed of varnished silk on light wooden frameworks, special varnish for the same, and very suitable looking cogwheels. Anyone interested in model aeroplaning could not do better than to procure a catalogue.

Reply to Mr. P. Moss's Query.

P.L. 1, writing in reply to the above, says: "The proper proportion of soft soap and graphite is one part soft soap and one part graphite—by measure, not weight. Better still, use graphite alone, rubbing it on the friction surfaces. For good adherence, however, the flake graphite, fine ground, is best, such as Dixon special 635 graphite.

R. L. B. STEELE.—No, it should not be necessary to make any re-adjustments.

KITE AND MODEL AEROPLANE ASSOCIATION.

Official Notices.

British Model Records.

Hand-launched	Distance	A. E. Woollard	...	477 yards.
	Duration	A. F. Houlberg	...	89 secs.
Off ground ...	Distance	G. Rowlands...	...	232 yards.
	Duration	A. F. Houlberg	...	51 secs.
Hydro, off ground ...	Duration	G. P. Bragg-Smith	...	25 secs.
Single-tractor screw, hand-launched	Distance	F. G. Hindsley	...	173 yards.
	Duration	F. G. Hindsley	...	36 secs.
Do., off ground ...	Duration	H. R. Weston	...	21 secs.

Aero Exhibition, Olympia.—Feb. 14th to 22nd, inclusive. This Exhibition was opened yesterday, 14th, and the Council of the Association hopes that all members will pay a visit to it to see the best model exhibits ever brought together in the world of scientific models, arranged by the R.Ae.C. and this Association. The Hon. Sec. will be at the Show from 6 to 10 each evening, and from 2 to 10 Saturdays. During the day, members of the Council will be present.

Flying Trials.—The ground trials will take place on Friday, Feb. 28th, at the London Aerodrome, time announced next week; and the hydro trials at Welsh Harp, Hendon, on Saturday, March 1st, at 2.30. The rules and regulations of this Association govern these trials.

Judges.—The judges appointed by the Association meet at the Princes' Rooms, Olympia, on Thursday, 20th, at 11 a.m. sharp. All members and exhibitors will be officially notified by post of the time judging will take place.

Membership.—A special endeavour will be made to increase the membership of the Association during the Show. All members are asked by the Council to induce at least two friends to join. Special forms will be on the Association's stand for this purpose.

27, Victory Road, Wimbledon, S.W. W. H. AKEHURST, Hon. Sec.

MODEL CLUB DIARY AND REPORTS.

CLUB reports of chief work done will be published monthly for the future. Secretaries' reports, to be included, must reach the Editor on the last Monday in each month.

Manchester Model Ae.C. (14, WARWICK RD. N., OLD TRAFFORD).

FEB. 22ND, Meeting at Heaton Park (meet at boathouse, 2.45.). If weather unsuitable, then the following Saturday. All models to be fitted with protectors.

S. Eastern Model Ae.C. (1, RAILWAY APPROACH, BROCKLEY).

FEB. 15TH. Members will visit Olympia, and the hon. secretary will be pleased to meet friends and prospective members at FLIGHT Stand between 3.30 to 4.30 p.m. and 7 to 8 p.m. Feb. 16th. Blackheath, 7.30 to 10 a.m. Lee, 10.15 a.m. to 12.15 p.m. Mitcham, 2.30 to 5.30 p.m. Chislehurst (cricket ground), 2.30 to 5.30 p.m.

Modellists at Olympia.

ANY readers of our Model Section who may wish to see, at the Olympia Show, Mr. V. E. Johnson, the Editor of the Model Section, may make an appointment to do so through FLIGHT Stand No. 26, just inside on the right of the Addison Road main entrance.

CORRESPONDENCE.

*** *The name and address of the writer (not necessarily for publication)* MUST *in all cases accompany letters intended for insertion, or containing queries.*

Correspondents communicating with regard to letters which have appeared in FLIGHT, would much facilitate ready reference by quoting the number of each letter.

Negative Angle Wing Tips.

[1720] I am obliged for your editorial note to my letter (1715). I think I understand Mr. Berriman's conditions correctly; his further remarks in FLIGHT of February 1st, agree with what you say, and Mr. Hume-Rothery's investigation agrees with Mr. Berriman's in recommending negative wing tips as conducive to stability and manageability of aircraft. I think Mr. Berriman either tacitly or expressly excluded from considerations of simplicity the motion of the air I contemplated in addition, it corresponding to a relative air rotation about the longitudinal axis, in the same sort of way as the one you mention corresponds to one about a vertical axis, and my object was to point out that the perfect way in which negative angle tips can obliterate the latter fits them specially for ascertaining to what extent and under what circumstances the former may occur. I believe that some of the irregularities exhibited at times by aircraft have been ascribed to whirls of the air about horizontal, or, at any rate, not vertical, axes.

MAURICE F. FITZGERALD.

Monkstown, Co. Dublin, February 1st.

Sun Soarability.

[1721] Mr. Dyott's account of his experiences in Central America is undoubtedly of great interest. One could have wished that he had given us a more lengthy and detailed account of his observations, which undoubtedly throw light upon what Dr. Hankin calls "sun soarability."

However, it should be remembered that by no means all the phenomena recorded by the latter observer are accounted for, if we admit that the air rises under the influence of the sun's rays. If I am not mistaken, Dr. Hankin's unwillingness to accept the up-current theory is based upon such phenomena as "canted flex-gliding" in which the bird travels beam on to the wind and canted away from it, but without leeward drift. Then we have the observation on the cheel which gained 150 ft. of height in a current which was descending at an angle of 15°, the air surrounding the bird being rendered visible by the presence of thin cloud which caused every atmospheric movement to be distinctly seen.

If this observation is accurate, all theories of soaring flight which are based on upward currents of air are untenable. It is, therefore, not surprising that Dr. Hankin should have sought another explanation for the phenomenon.

It is to be noted that instances were given of upward currents in the neighbourhood of dust storms, which were unsoarable and of downward currents in the centre of these storms which were soarable. It is obvious, therefore, that the theory of air energy cannot be lightly set aside, and we shall await with interest the publication of further observations which Dr. Hankin has promised us.

I admit that upon first reading the Hankin papers I was sceptical about the conclusions arrived at in spite of the convincing accuracy of the observation, but being interested I set to work to make observations upon English birds and soon proved that sun soarability and other phenomena are just as strikingly exhibited in England as in India, but they are undoubtedly less obtrusively exhibited and need to be more carefully sought out. This is partly due to the fact that our finest soaring bird, the kite (called the cheel in India) is now nearly exterminated, although a reminiscence of its constant habit of soaring is preserved in the name given to the device which is flown by means of a string. Our two species of eagle, also, have been driven into the wilds of Scotland, although in early times they were not uncommon in England.

With regard to my own observations, it was a long time before I came across anything of a definite character opposed to the idea of the soaring bird being supported by means of upward currents on a large scale, although I soon found facts opposed to the pulsating wind theory. Lately, however, I have come across facts which seem to prove definitely that unless we are prepared to admit an upward velocity in the air which, combined with an horizontal component of not more than 3 miles per hour, is sufficient to support a weight of half a pound by means of an area of 1 sq. ft. On sunny days in the month of October, the theory of upward currents to account for soaring flight is untenable.

There is one other point which I should like to mention in connection with Mr. Berriman's suggestion of the use which birds may make of a negative inclination of the wing tip. Having examined and dissected a considerable number of birds, including vultures, I am able to say that the wing tips of all birds seem to be designed rather to prevent the possibility of the pressure from above exceeding that from below than otherwise. In order for the primary quills of the vulture's wing tip to sustain pressure from above they would have to be bent downwards to a greater extent than their natural curvature, which would mean that their tips would point downwards at an angle less than 95 degrees with the vertical.

It is true that sea birds do not carry the wing tip rotated up as vultures appear to do, but I do not think it is ever rotated down to more than a neutral angle except as a momentary adjustment. The slightest pressure on the top of the outer primaries causes them to separate and so greatly lessens the effect produced. My observations appear to show that some soaring birds which have the pointed type of wing tip carry the outer part of the wing at a larger angle of incidence than the inner portion when flex-gliding in soarable air, but rotate it down when gliding slowly in a strong up current.

G. HOWARD SHORT.

Monoplane Wing Failures.

[1722] I have read with considerable interest the articles and correspondence in your excellent journal, on the collapse of monoplane wing, and while it is possible that there may be something in the various theories put fourth, I think that it will eventually be found that this class of accident is due more to drift or head resistance stresses on the wings than to any other cause.

It is perfectly clear that the design of the tractor monoplane offers inadequate facilities for providing a necessary factor of safety in this respect, as it does not permit of a sound system of drift staying, especially in machines of the Antoinette type, with a high aspect ratio, on which I think I am correct in saying that most of the accidents of this kind have occurred.

It is obvious that the drift stresses on the wings must at all times during flight be very considerable, and in descending the danger from this cause greatly increases as the machine's speed is accelerated by gravitation, and a considerable percentage of the lift stresses are converted into drift. As regards M. Blériot's theory of the downward pressure on the wings, when the machine in descending is diverted from its horizontal course, it must be borne in mind that this can only happen when the centrifugal force set up is sufficient to supersede that of the machine's gravitation, and I am extremely doubtful as to whether this really ever occurs. The fact that the wings in some cases appear to collapse downwards cannot be considered as evidence in support of this theory, as when a wing first starts to go it might for the moment assume any position before finally collapsing.

Mitcham, February 4th. G. R. BRAGG-SMITH.

The "Tyne" as Government Aero Base.

[1723] To-day the local Press again mention the long-talked of intention of the Government to establish aero stations on the North-East Coast, and of which *one* is actually now settled in the far north of Scotland. And the locality of others has also been mentioned.

Yet, strange to say, one of the most important and most vital ports in the kingdom of Britain has not been yet mentioned.

There on the Tyne we have a river, port, and monster manufacturing district whose vital importance to the kingdom is known world wide and which is specially well known to every foreign nation.

Also in this locality, we have facilities for an aero base, second to none in the kingdom.

From Tynemouth to Blyth we have a 10 miles stretch of coast (bays and sands), which cannot be excelled in England for the purpose, with miles of flat inland country also: repair yards and factories unlimited, where every demand and requirement of even the greatest flying squadron could be supplied instantly.

Berwick-on-Tweed, we are told, is intended as our nearest aero station, but to what use that station, sixty miles distant, can be to the "Tyne" I defy the brainiest official to explain.

Newcastle, January 5th. TAXPAYER.

The Rocket Plane.

[1724] I have read with much interest in your issue of January 4th, 1913, the experiments by Mr. L. F. Hutcheon with his model rocket plane. I quite agree with the possibilities of the rocket principle as motive power for light models, but when he proposes to use it for launching full-sized hydroplanes, I really cannot conceive

how it would be possible to create a jet or jets sufficiently powerful to launch such planes.

Even if an unusual big charge of gunpowder were used, the jet thrust would be infinitesimal.

It would, however, be interesting to know what h.p. could be obtained per pound weight of gunpowder, also the weight of some of the most powerful rockets in use, the charge they contain, and what height they will rise in the air.

W. Kensington. C. HEYERMAN.

Guns on Aeroplanes.

[1725] I should like to impress upon your readers the extreme value of your suggestion recently at the tail of correspondence (1704), and to point out that this idea was also very strong with the Committee of the War Office in regard to the trials at Salisbury Plain. They said that there was one, and one only, of all the inventors, who had really considered the requirements of warfare, and that one was Mr. R. C. Fenwick, who was unfortunately killed in an accident. Mr. R. C. Fenwick before his death patented his machine in conjunction with Planes, Ltd., Patent No. 22809, of 1911. By this invention alone can an aviator fire straight ahead or in any direction through an arc of about 200°. Nearly all other machines have the propeller in front which prevents this. Any person therefore wishing to design a machine for war purposes would do well to consider carefully Fenwick's specification, No. 22809 of 1911, obtainable for 8*d* at the Patent Office.

W. P. THOMPSON,
Chartered Patent Agent.

6, Lord Street, Liverpool.

AIRSHIP NEWS.

King Alfonso in a Dirigible.

ACCOMPANIED by Prince Leopold of Battenberg, King Alfonso made a trip of some twenty minutes over Madrid on the 7th inst. in the Spanish military dirigible "Espana." The Queen of Spain was present at the aviation ground.

Trials of Clement-Bayard Airship.

THE new Clement-Bayard airship built for the Russian Government was up for 22 mins. over Lamotte Breuil on Sunday morning, and on Monday made a cruise of over an hour's duration over the neighbourhood.

Trials with a New Parseval.

THE new Parseval airship "P II" was out for a twelve-hour trial cruise on the 7th inst. Starting from Bitterfeld at 5.30 a.m. she landed again at 5.30 p.m.; during the trip an altitude of 1,700 metres was attained.

A Zeppelin on Trial.

ALTITUDE tests were carried out with the new Zeppelin stationed at Oos on the 5th inst., but no figures are obtainable as to the height reached. Leaving her hangar at a quarter to six the airship remained in the air for 8¾ hours. On the previous day a party of Austrian officers enjoyed an hour's cruise in the airship over Baden Baden.

Extensions of Bristol Co.

IN order to cope with the increased business in Bristol machines, both at home and abroad, it has been found necessary to increase the capital of the firm. At a meeting of the British and Colonial Aeroplane Co., Ltd., held on Monday last at Bristol, Sir George White, Bt., presiding, it was decided to raise the capital from £100,000 to £250,000.

Army Biplane in Regent's Park.

REGENT'S PARK had its second *homme-oiseau* visitor on Monday last, when Capt. Darbyshire, after losing his way through fog on a trip from Aldershot to Uxbridge, found a landing place there. Troubled with a failing engine, the pilot decided to descend at the first suitable spot, but his task was rendered more difficult by the thick fog. Catching sight of some trees, however, he came down gradually from a height of 2,000 ft., and on making an abrupt landing found he was in Regent's Park. The machine was somewhat damaged, and later in the day was dismantled and sent back to Farnborough.

Tobacco by Aeroplane.

BY way of introducing a new brand of tobacco, the Robert Sinclair Tobacco Co. of Newcastle arranged with Mr. B. C. Hucks to carry on his Blériot parcels of the tobacco in special souvenir tins to the neighbouring villages. One parcel was taken to Seaham on Tuesday, the 18 miles being covered in as many minutes.

THINGS WE SHOULD LIKE TO KNOW.

DOES the 16 to 10 business mean that Germany has come to the conclusion that Dreadnoughts, after a certain limit, are not so important as aircraft.

? ? ?

A Greek aeroplane has in safety flown over the Dardanelles, located and reported on the Turkish Fleet, and dropped bombs. *Now* shall we start to encourage home constructors.

? ? ?

Whether Sabelli will win all the bomb-dropping competitions this year, after his experiences in the near East.

? ? ?

That's done it. The New York correspondent of the *Standard* says: "Invisible aeroplanes will soon be in use by the United States War Department. The 'Invisible' material is liquid moulded into shape." Isn't a "Manhatton" good as a tail elevator.

? ? ?

Can't you please get the tail of your monoplane up a bit and stop some of that side-slip. It makes us shudder.

? ? ?

Which is worse, the verse or the subject?

12 a day for standing by,
Pound a day for flying,
Total 84 a week,
What's the use of crying?

Don't you get a flight sometimes?
Mustn't we save money?
You can't expect the busy B.E.'s
To gather all the honey.

? ? ?

What is the difference between Venus and an airship? Is it only a question of fabric(ation).

? ? ?

Though Bielovucic's "glide" over the "Gaby" pass may have been graceful, can we say the same after a "Turkey trots" display on a Hendon biplane.

? ? ?

Don't quite half the spectators think the machine is out of control.

? ? ?

Might we suggest it looks horrible.

? ? ?

Why doesn't someone fly the fast little Caudron monoplane and gather in some of the "speed" money.

? ? ?

Whether *the* Show is going to be a big success and wake things up a bit.

? ? ?

Will the Atlantic flight really come off this year.

"WILL-O'-THE-WISP."

IMPORTS AND EXPORTS, 1912-13.

AEROPLANES, airships, balloons, and parts thereof (not shown separately before 1910):—

	Imports.		Exports.		Re-Exportation.	
	1912.	1913.	1912.	1913.	1912.	1913.
	£	£	£	£	£	£
January ...	619	12,097	2,412	4,005	—	1,510

Aeronautical Patents Published.

Applied for in 1912.

Published February 13th, 1913.

1,432. M. L. ORR. Propelling airships, aeroplanes, &c.
14,375. G. ROSE. Propelling aerial machines.

[EDDIES and other usual features are necessarily held over this week.—ED.]

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